

ASSESSING STANDARD-COMPLIANCE OF PUBLIC
INSTITUTION WEB SITES OF TURKEY

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF INFORMATICS
OF
THE MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
THE DEPARTMENT OF INFORMATION SYSTEMS

JUNE 2012

**ASSESSING STANDARD-COMPLIANCE OF PUBLIC INSTITUTION WEB
SITES OF TURKEY**

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ABSTRACT

ASSESSING STANDARD-COMPLIANCE OF PUBLIC INSTITUTION WEB SITES OF TURKEY

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June 2012, 85 Pages

Since 2003, almost every public institution has developed a web site through e-transformation project (eDTr) in Turkey. When there are so many institutions and different web sites, a need for standard becomes inevitable. To address this need, a standard was published by TÜRSAT A.Ş. in January 2009 which constitutes of the rules and recommendations for these web sites referencing international web standards as well.

The purpose of this study is to analyze the compatibility of public institutions' web sites in Turkey with the TÜRKSAT standard. In this study, 32 rules are selected to be verified for 50 public institution web sites. 20 of the rules are verified with a tool named WSSCV which is developed in the context of this thesis, 5 of the rules are verified with a commercial tool named Total Validator, and 7 of the rules are verified manually.

Results show that, the standard prepared by TÜRKSAT is not used during the development of a public institution web application. Compliance of the checked web sites to the standard is very low. However, the standard also needs to be updated according to today's technology.

Keywords: Turkey, Public Institution, Standard Compatibility, TÜRKSAT, e-government

ÖZ

TÜRKİYE'DEKİ KAMU KURUMU İNTERNET SİTELERİNİN STANDART UYGUNLUĞUNUN DEĞERLENDİRİLMESİ

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Haziran 2012, 85 Sayfa

2003 yılından bu yana Türkiye'de e-dönüşüm projesi (eDTr) sayesinde hemen her kamu kurumunun bir internet sitesi var. Bu kadar kamu kurumunun ve her birine ait farklı internet sitesinin varlığında, hepsini kapsayacak bir standart ihtiyaç haline geldi.

Bu ihtiyacı karřılamak için TÜRKSAT A.ř. 2009 yılının Ocak ayında kamu kurumları internet siteleri için kurallar ve öneriler içeren ve aynı zamanda uluslararası internet standartlarına da referans veren bir standart yayınladı.

Bu tezin amacı, Türkiye'deki kamu kurumlarının TÜRKSAT'ın yayınladığı standart ile uyumluluğunu analiz etmektir. Bu çalışmada TÜRKSAT standardından 32 kural seçilmiş ve belirlenen 50 kamu kurumu üzerinde bu kurallar kontrol edildi. Seçilen kuralların 20 tanesi WSSCV adı verilen, ve bu tezin kapsamında bizim tarafımızdan geliştirilmiş olan bir araç ile kontrol edildi. 5 tanesi profesyonel bir ticari araç olan Total Validator ile geri kalan 7 kural ise manuel olarak kontrol edildi.

Bu çalışmanın sonucuna göre, TÜRKSAT tarafından hazırlanan standardın kamu kurumları internet sitelerinin geliştirilmesinde yaygın olarak kullanılmıyor. Standarda olan uyumluluk az. Fakat bunun yanında ulařılan bir başka sonuç da, standardın da günümüzün internet teknolojilerine göre güncellenmesi gerektiğı.

Anahtar Kelimeler: Türkiye, Kamu Kurumu, Standart Uyumluluğı, TÜRKSAT, e-devlet

To My Husband

ACKNOWLEDGEMENTS

First of all I want to express my sincere appreciation to my supervisor Assist. Prof. Dr. Aysu Betin Can for her guidance, patience and encouragement. Also, I would like to thank to Assist. Prof. Dr. Aydın Nusret Güçlü for the main idea of this thesis and his valuable comments.

I also thank to Prof. Dr. Kürşat Çağiltay, Assoc. Prof. Dr. Altan Koçyiğit and Assoc. Prof. Dr. Sevgi Özkan for their comments and contributions. This study became more valuable with their review.

Finally, I would like to thank my husband Şaban İhsan Yalçinkaya for his support, love and patience. Without his understanding, this study would never end.

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CHAPTER I

INTRODUCTION

1.1 MOTIVATION

In 2003, a project named electronic transformation (eDTr) has begun in Turkey (BTD, 2003). There are more than one purposes of this project listed officially. All the stated purposes are, in fact, about increasing the usage of technology for sharing knowledge with citizens and increasing the awareness of Turkish people about processes and procedures in their country. One pillar of this project that we focus on is named as e-government. E-Government is defined as “Serving the services provided by the state electronically. The purpose is delivering the government services to citizens in the most effective, easy, qualified, uninterrupted and safe way.” in the entry point of e-government applications of Turkey (www.turkiye.gov.tr).

Since the place of internet in daily life is indisputable, the first step of e-government project is constructing web sites for public institutions and serving citizens. The number of public institutions in Turkey is remarkable and nowadays each of them should have individual web sites to serve citizens. Increasing population of these web sites brought the necessity for a standard to make them understandable, reachable, and maintainable.

As a result of this necessity, in August of 2006 a guideline was published by TÜBİTAK-MAM for public institutions' web sites (TÜBİTAK-MAM, 2006). However, this publication was only a guideline; not a standard. Later, a standard was published by TÜRKSAT (TURKSAT, 2009). This standard was based on the guideline prepared by TÜBİTAK-MAM and formed by taking into account many international standards.

This standard is currently maintained by TÜRKSAT A.Ş. and has a support web site (www.kakis.gov.tr), includes information about basic concepts expressed in the standard, and tells about the benefits of the standard usage. Rules listed in this standard are categorized under 21 main topics. Details of national and international web standards are discussed in chapter 2.

1.2 PROBLEM STATEMENT

Although there is a standard published for public institution web sites, there is no authority to audit the organizations that are responsible from the development of institution's web sites in terms of compatibility.

Research questions that guide this study are as follows:

- ❖ What is the average compliance ratio of a public institution web site to TÜRKSAT standard rules in Turkey?
- ❖ How can we verify the rules in the standard of TÜRKSAT?
- ❖ Are the rules in TÜRKSAT standard applicable and correct?

The first research question is the main purpose of this study; to analyze standard compatibility of public institution web sites. When the literature is reviewed, there are studies conducted in Turkey for this aim. However, each of them evaluates the web sites from different perspectives with different methods. Generally, the web sites are evaluated in terms of Accessibility and Usability. Our research differs from the conducted studies at this point.

Rather than focusing only to these concepts, we aim to evaluate the web sites with respect to several aspects included in the TÜRKSAT standard such as lists, tables, meta data, navigation. Furthermore, in our study, we use objective methods for evaluation such as automated rule checking instead of subjective methods such as surveys.

We examine the standard and extract 32 rules for this thesis to use for verification. Three different methodologies are used to verify these rules. A tool named Web Site Standard Compatibility Verifier (WSSCV) is developed in the context of this thesis to verify a set of rules, second method is a commercial and professional tool named Total Validator (Total Validator, 2008), and last method is manually verification.

50 public institution web sites are selected to be verified in the context of this thesis. 32 rules are verified for each selected web site. The collected results are evaluated from 4 different perspectives.

First the results are evaluated rule based. In rule based evaluation, violation ratio of each rule is calculated. There are two attributes used to calculate the violation ratio, number of the points in the source code of the web page where the rule is applicable and the number of the points in the source code of the web page where the rule is violated.

Aim of this evaluation is to determine which rules are violated frequently. Since the whole verification result database is huge (27776345 records), only the results of home pages of these web sites are interpreted. The results show that, in most of the public institution web site applications only the best-case scenario is considered. Therefore, rules that define the behavior of the application in case of exception or rules that help the indexing of the web page by search engines, or rules that ease the maintenance phase of the web application project are violated. Another finding of the rule based evaluation is the need for a revision of the TÜRKSAT standard. The standard should also be updated synchronously with the web application technology update, or the standard should be written generally.

Second perspective is web site based evaluation. In this evaluation, we calculated how many rules that the web sites are violated from selected 32 sites and compared the public institution web sites violation ratio. Home pages of 50 selected web sites are analyzed. There is no web site that complies with all of the selected rules; besides, the average violation ratio of the web sites is 46.40%. As the ratio shows, the standard compatibility is not a concern in our country for public institution web site development.

Third evaluation is performed with Total Validator tool. With this evaluation, we are looking for the answer to “Are Turkish public institution web sites developed as compatible to international web application development standards?”. According to the results, the compliance to international World Wide Web Consortium (W3C) standards is lower than the compliance to TÜRKSAT Guideline. Last evaluation includes only one web site (www.meb.gov.tr), with all the web pages in this site and we have applied all of the rules.

1.3 SIGNIFICANCE OF THE STUDY

This study will reveal the compliance of public institution web sites to TÜRKSAT standard. 50 public institution web sites are selected to evaluate. The comprehensive results of this study will lighten these public institutions about their web sites’ weaknesses and strengths.

This study analyses not only the compliance of the selected web sites to TÜRKSAT standard but also the correctness of the TÜRKSAT standard. Therefore, this study will provide a kind of status report for both public institution web site developers and standard developers.

WSSCV is developed flexible for plug-ins. With this capability, verification of all rules will be able to be performed from one tool with a few updates. The verification results will be descriptive and guide for correction. WSSCV will be a verification tool specific to public institutions’ web sites.

1.4 **THESIS OUTLINE**

The rest of the thesis is outlined as follows: chapter 2 includes the literature review study. Methodology used in this thesis is explained in chapter 3. Collected results are evaluated from different perspectives in chapter 4; discussion of the thesis is given in chapter 5. Last chapter, chapter 6 includes the brief summary of this thesis and the results.

CHAPTER II

RELATED WORK AND BACKGROUND

In this chapter, the studies conducted in Turkey and also in the world that concerns this study or intersects at one point are explained along with the standards which are the starting point of all these publications. In addition, major technologies used during this study are also explained in this chapter.

2.1 E-GOVERNMENT WEB SITE EVALUATION

In this section, both national and international studies conducted about e-government application evaluation are explained.

2.1.1 INTERNATIONAL STUDIES

E-government is a rising trend not only in our country but also in the world. All countries are working on e-government concept. Besides, they are developing their own standards and guidelines. In this section, we examine the literature and their evaluation results of public institution web sites in different countries.

In 2003, Wood, Siegel, LaCroix, Lyon, Benson, Cid and Farris (2003) proposed an approach about e-government web site evaluation in the United States.

There was no evaluation result or any observation about public institution web sites of U.S.A. This study became an entry point for most of evaluation studies both in their country and in other countries.

The approach proposed was a multidimensional approach. According to the article this approach is the key point of web site evaluation. The dimensions of their approach consisted of the following four parts:

- ❖ Usability Testing
- ❖ User Feedback
- ❖ Usage Data
- ❖ Web and Internet performance data

Advantages, disadvantages, cost, limitation and methods were described for each part. Also the conditions that these methods are applicable and most effective were defined one by one. Wood et al. (2003) described the criteria shown in Table 2.1 for selecting a method.

Table 2.1 Method Selecting Criteria defined in Wood et al.
(Level 1 means less important; Level 2 means Moderately important and Level 3 is Very Important)

Evaluation Method	Web Site Life Cycle Stage		
	Development	Operations	Improvement
Usability Testing			
Expert Review	Level 2	N\A	Level 2
Usability Test	Level 3	N\A	Level 2
Feedback for usability	Level 1	N\A	Level 1
User Feedback			
Internal User Survey	N\A	Level 3	Level 3
External User Survey	N\A	Level 1	Level 1
Focus Group	Level 2	Level 2	Level 3
Nationwide Syndicated Survey	Level 1	Level 2	Level 2
Unsolicited user feedback	N\A	Level 2	Level 2
Usage Data			
Web log data analysis	N\A	Level 3	Level 3
Internet audience measurement	Level 1	Level 2	Level 2
Web and Internet Performance	Level 1	Level 2	Level 2

Wang, Bretschneider and Gant (2005) proposed a new method for web site evaluation and also applied the method on a web site in 2005. The model focused on user and data relationship. Measurement was based on user's reaching information. The model was formulized by the authors as follows:

$$P = f(C, T, S, C \times T, C \times S, T \times S, C \times T \times S) \text{ (F1.0)}$$

P was described as measure of the performance of web-based information seeking; C was a collection of user's characteristics; T was a collection of information task characteristics; and S was the collection of government Web site characteristics. This formula was adaptable for different web sites, since each web site had own dynamics, so characteristics differed from each other. This model was applied on Syracuse City School District web site. Since the model was user-centered, they claimed that the model could be also applied to e-government web sites easily.

Garcia, Maciel and Pinto (2005) proposed another method for web site evaluation and examined Brazilian public institution web sites. This method was an expanded version of Nielsen's evaluation method (Nielsen, 2001). Nielsen had prepared a checklist for usability of an interface. Nielsen's method depended on human judgments, according to this method checklist items are controlled by an expert. The authors added 6 more components(Accessibility, Interoperability, Security and Privacy, Information Reliability, Service Agility, Transparency) to Nielsen's method and collected the combination of components in 5 groups(Cognitive Effort, Tolerance, Reach, Physical Effort, Trust).

127 Brazilian public institution web sites were evaluated by Garcia et al. (2005) with their developed method. Each checklist item had a score; 0, 1 or 2.

Both specialists and students performed this validation to make sure about the objectivity of the checklist prepared. At the end of the evaluation average was calculated and used as result. These 127 web sites were also evaluated with Nielsen method, to compare the final results. According to the results, number of violation in the web sites

is higher than the Nielsen method evaluation results. Since the expanded method was detailed and had more number of checklist items, the results were claimed to be more realistic.

After the evaluation and comparison, it was obvious that Brazilian web sites were not high-qualified. This study suggested having a guideline for Brazilian e-government web sites to reach a level of quality in e-government applications.

In 2005, Abanumy, Al-Badi and Mayhew (2005) performed a study on Saudi Arabia and Oman public institution web sites. This article evaluated the accessibility of Saudi Arabia and Oman ministry web sites. In Saudi Arabia, there were 21 ministries but only 13 of them had web sites. In Oman, there were 22 ministries and 14 of them had web sites. All of these 27 existing web sites were evaluated. This evaluation was completed in 3 steps. First, the compatibility with W3C accessibility guidelines were checked, since there was a local standard neither in Saudi Arabia nor Oman. This check was performed with an automated and free tool Bobby (CAST, 1999) which is suggested by W3C. In second step, keyboard and mouse usage and also HyperText Markup Language (HTML) coding rules were checked. For this step 3 different tools were used:

- ❖ Multiweb: Developed by Daekin University (no longer available)
- ❖ LYNX : This was a text editor.(Delorie, 2004)
- ❖ W3C validation service: Public service of W3C for HTML validation.(W3C, 2004-2010)

In this step, all checked web sites are failed. The authors checked U.K. government web sites to test their evaluation methodology and to make sure that the results on their experiment were valid. The U.K. e-government web sites were compatible to the rules checked. After this devastating result, a survey was conducted with developers of Saudi Arabia and Oman public institution web sites.

Questions were prepared to evaluate the awareness of the authors about web accessibility guidelines and to see their ascendance to accessibility concept during their development phase and also to find the main causes of these failures. The results of the survey show that, these countries should prepare a guideline for e-government web sites first. Second, awareness of the developers should be increased about the importance of web accessibility.

In Australia, Henriksson, Yi, Frost and Middleton (2006) conducted a study about e-government web site evaluation. They proposed a tool for evaluating public institution web sites. There were 106 questions grouped in 6 categories; Security and Privacy, Usability, Content, Services, Citizen Participation and Features. These 106 questions were asked to developers of Australia government web sites to make the tool more realistic. This study focused on the instrument developed more than the evaluation results of the web sites.

Chinese government web sites were evaluated by Shi (2007). Shi (2007) evaluated 324 government web sites in terms of accessibility. The compliance of these web sites to Web Content Accessibility Guidelines 1.0 (W3C, 1999b) was examined. Homepages of these 324 web sites are evaluated by Bobby Online (CAST, 1999). 323 of 324 web sites had failed from this evaluation. The most common error of these web sites was about alternative texts of images. There was no instructive text about images in HTML code.

Another study about e-government web site evaluation was conducted by Hong, Katerattanakul and Joo (2007) compared 4 Korean and 4 U.S. government web sites. Web sites of both countries were evaluated both in 2004 and 2007.

Improvement of country web sites and comparison of country web sites were analyzed. Accessibility evaluation was performed according to priority 1 and 2 rules of WCAG (W3C, 1999b). The evaluation was performed in two parts. First, the homepages of these web sites were checked with an automated tool named A-Prompt (ATRC, 2007) which was developed by University of Toronto. Second part of the evaluation was performed

manually; human-experts checked the HTML code line-by-line for accessibility errors. Both in 2004 and 2007 Korean web sites had two times higher number of errors according to U.S. government web sites. Compliance degree of U.S. government web sites had decreased in 2007, because of design updates. This result proves that, whenever design was updated, accessibility control should be done accordingly too. Another point of this study that could be mentioned was the difference between manually obtained results and results of an automated software tool. When the difference was examined, tool also showed the possible errors but the human-experts looked for only actual errors. However, the difference between result sets did not change the overall result of the study.

Pina's study (2009) was different from others in terms of country selection. In this study, 15 countries of European Union were examined. 5 government web sites were selected from each country to evaluate. A questionnaire consisting of 73 questions was grouped in 5 categories as Transparency, Interactivity, Usability and Web Site Maturity. Transparency was described as "Transparency in web sites refers to the extent to which an organization makes information about internal work, decision processes and procedures available". These web sites were examined both in 2004 and 2007 to be able to see the evolution. Results of the questionnaires were analyzed by using different methodologies. This was the second point that made this study different from others, tests of difference of means, multidimensional scaling and cluster analysis were used. As a result all selected countries had improvements between 2 time spans in their web sites. However, still the compliance percentage was very low.

Kuzma (2010) analyzed 130 of U.K. government web sites in 2010. An online evaluation tool named Truwex (Erigami, 2007) was used to check the compliance of these web sites with WCAG 1.0 (W3C, 1999b) and WCAG 2.0 (W3C, 2008). Priority 1.0 and 2.0 rules were checked since the study only evaluates with respect to accessibility. Only 20% of these 130 sites was successful according to WCAG 1.0

(W3C, 1999b). According to WCAG 2.0 (W3C, 2008), 5% of 130 web sites was successful.

Conolly, Bannister and Kearney (2010) evaluated Irish e-government applications. This evaluation was performed for only one site. This site was used for taxing operations. The reason of this selection was its usage rate. The site was one of the most visited e-government web sites. A measuring method named as E-S-QUAL (Parasuraman, Zeithaml & Malhotra, 2005) was starting point of this study. They expanded E-Q-QUAL method, added new questions and obtained a survey. This survey was sent to 22.000 citizens via e-mail, 30.3% of these citizens was replied with answers. Results of this study showed that service quality of the site was enough for citizens.

In Malaysia 9 e-government web sites were evaluated by Latif and Masrek (2010). These websites were evaluated with respect to WCAG 1.0(W3C, 1999b) with Bobby (CAST, 1999). Beside the automated tool, also a survey was conducted with the developers to evaluate the awareness about the accessibility. Most common problem of these web sites was about alternative text in images, image type buttons, etc. The result of the survey showed that, most of the developers did not know the importance of accessibility, and they did not develop their code according to WCAG.

Last related work from the world was conducted in Alabama by Youngblood and Mackiewicz (2011). 129 web sites were evaluated in terms of both usability and accessibility. WAVE (WebAIM, 2001) was used to evaluate the accessibility of web pages.

Only home pages of these 129 web sites were checked to see compliance of web sites with WCAG (W3C, 2008) Priority Level 1.0. Also these 129 home pages were examined with Markup Validator (W3C, 2004-2010) for HTML code errors. Findings of this study were; absence about navigation (no breadcrumbs trail), and the links. In 75.1% of the pages links did not change color after clicked by user.

2.1.2 STUDIES IN TURKEY ABOUT PUBLIC INSTITUTION WEB SITES

Akinci and Çağiltay (2004) conducted a study about usability of e-government web sites in 2004. This study evaluated 6 public institution web sites (www.meb.gov.tr, www.saglik.gov.tr, www.egm.gov.tr, www.nvi.gov.tr, www.telekom.gov.tr, www.ankara-bel.gov.tr) with 6 participants. Evaluation was performed by observing participants. A set of tasks were defined for each web site and participants were asked to try to complete the defined tasks. The results showed that none of these 6 web sites were designed usable. Most common problem was usage of the menus. Tasks defined for web site of Ministry of Education has the lowest completeness ratio, and tasks defined for web site of Ministry of Interior General Directorate of Civil Registration and Nationality has the highest completeness ratio.

The second study about e-government web site evaluation in Turkey was not an academic study, an audit report submitted by Turkish Republic Court of Auditors (2006). This audition was performed by government employees to e-government components in other words public institution web sites. The aim of this audition was to measure the capability of current services for meeting the expectations of eDTr (BTD, 2003) project. The audited web sites were expected to be understandable by end-user, accessible, well designed and as compatible as possible to international standards.

This report was completed and published at 2006. However, the preparations were started at 2005. 32 public institution web sites were audited for 35 different criteria.

These criteria were categorized under design, crawl, content and reachability (APPENDIX A). Tests were performed by 8 people manually by observing the web sites one by one. Each criterion was scored for each web site than a report was prepared for each one. Result of this audition was not very satisfactory for e-government concept. Figure 2.1 presents the results that show the mean scores of web sites for the applied criteria. Each mean score shows the compliance ratio of the web site to the criteria.

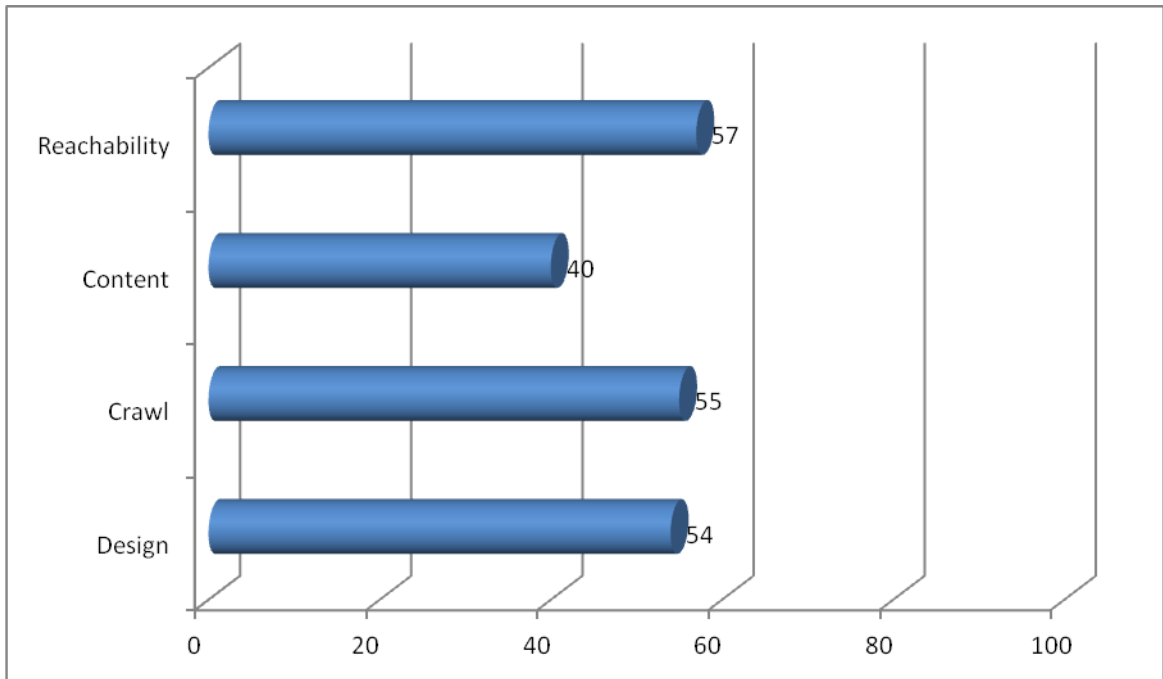


Figure 2.1 Results of Audition performed by Court of Auditors in 2006
(Each bar shows the mean scores of evaluated web sites for applied criteria)

The third study conducted in Turkey was about evaluation of public institution web sites in terms of e-government applications (Alır, Soydal & Öztürk, 2007). Different from the previous one, this report was published after the guideline of TÜBİTAK-MAM (TÜBİTAK-MAM, 2006) was released. In this study 24 public institution web sites were evaluated with a set of criteria with 30 items under 8 major categories (

APPENDIX B). Except technical properties and title information, each criterion was controlled manually.

For technical criteria WebXACT (Watchfire, 2003-2004) tool was used. This tool was only applicable for single page, and it did not crawl all sub pages provided by given URL. The results showed that the web sites were not compatible with the guideline of TÜBİTAK-MAM as much as they should be. This study differs from ours at the point of controlled guideline. Our study is based on the compatibility to TÜRKSAT standard, whereas the study of Alır et al. (2007) is based on guideline of TÜBİTAK-MAM.

In 2011, a paper about e-government web sites was submitted in a conference (Kaygısız, 2011). In this paper 4 web sites of Turkey (www.meb.gov.tr, www.ibb.gov.tr, www.mkutup.gov.tr, www.ankara.gov.tr) are evaluated and compared with “www.turkiye.gov.tr” according to standard published in Turkey for public institution web sites (TURKSAT, 2009). Accessibility check of these websites was performed with an automated tool developed by University of Toronto. According to results of this step, contrast was a general issue for all of these web sites and also there was a serious problem about alternative texting of images. In the second step of the evaluation operating system compatibility and browser compatibilities were checked. Author did not use any tool for these controls, and performed manually. Web sites were evaluated under 3 operating systems (Windows, Linux, MacOS) and 4 internet browsers (Microsoft Internet Explorer, Mozilla Firefox, Google Chrome, Opera). Beside these compatibilities, homepage capabilities, link properties (except broken links) were controlled manually too. The conclusion of the author after the examination of the results proved that public institution web sites were not developed compliant with standard (TURKSAT, 2009). The difference of this study from this thesis, first of all, is the number of samples. In this thesis, number of selected sites are 50. There are 235 public institution web site addresses listed in www.turkiye.gov.tr. The conclusion is reached with four samples out of 235 (at least 235, because, municipality and military organization web sites are excluded from this list).

This study focuses on the appearance of the web site and the properties controlled are about appearance of the web site. In our study there is not a specific topic focused on from TÜRKSAT standard (Rule categorization topics). Therefore, there are both common and different web site properties controlled in two studies.

Another important difference is the level of detail. In this thesis, HTML source codes of the web sites are evaluated. Number of rules checked is higher and selected rules to evaluate are not limited to manual verification. Also, the methodology used in this thesis is different. We developed a tool to iterate and check all of the pages of a web site.

Last study from Turkey about e-government web sites was a master thesis. Durmuş (2012) evaluated the e-government web sites in user-centered design manner. 33 web sites were evaluated with 107 checklist items under 8 categories. In this study, each category check was performed by more than one tool to be sure about the accuracy of results. Besides, an interview was performed with Information Technologies (IT) departments. At the end, each web site reached an average score. If the score was in range of [80,100], that website was meant to be well-designed. Range [70-80] was good-designed. 1 of 33 websites reached to 80 points, 8 of them were good-designed.

First difference between Durmuş's study (2012) and this thesis is the aim of the study. Aim of Durmuş's study (2012) is evaluating e-government web sites according to user approach, but in our study the aim is to see the compatibility of the web sites to TÜRKSAT guideline with all aspects.

Durmuş's study (2012) includes only public institution web sites that have e-government applications. However, in our thesis, there is no such limitation, web sites that include e-government applications and the ones just have information about the institution are evaluated. Besides, 33 web sites are evaluated in this study. However in our thesis, sample web site number is 50.

In Durmuş's study (2012), general layouts of the web sites are examined since only user capabilities are evaluated. However in our thesis, every web page of the web site can be evaluated with the tool WSSCV developed for this thesis. As the last difference, methodologies to collect results are not same. In our thesis, subjective methods such as surveys are not used.

Table 2.2 lists all related works conducted in Turkey (including this thesis) and shows the key points of these studies for comparison with this thesis.

Table 2.2 Summary of Related Works from Turkey

Year	Author	Purpose	Sample Size	Approach	Key Findings
2004	Akıncı & Çağiltay	Usability evaluation of public institution web sites	6	A set of tasks were defined for each web site. Behavior of these 6 participants' (one for each web site) was observed.	-For general, web sites were not designed usable. - Menu usage was the most difficult part of the tasks for all participants
2006	T.R. Court of Auditors	Capability measurement of current services for meeting the expectations of eDTr	32	35 different criteria were categorized under 4 topics and weighted. Scoring was performed manually.	- Compliance ratio to the defined criteria was low.
2007	Alır, Soydal & Öztürk	Evaluation of compliance with the guideline of TÜBİTAK-MAM	24	30 different criteria were categorized under 8 topics. A set of criteria was evaluated manually. Also, WebXACT was used to check accessibility. Only home pages were evaluated.	-Web sites were not compatible with the guideline of TÜBİTAK-MAM as much as they should be.
2011	Kaygısız	Evaluation of the compliance with TÜRKSAT standard in terms of <ul style="list-style-type: none"> • Accessibility • Operating system compatibility and browser compatibility 	4	Accessibility check of these websites was performed with an automated tool developed by University of Toronto. Operating system compatibility evaluation was performed manually.	- Contrast was a general issue for all evaluated web sites - Public institution web sites were not developed compliant with standard
2012	Durmuş	Evaluation of e-government web sites in terms of user-centered	33	107 criteria were categorized under 8 categories. Each	-1 of 33 web sites was well-designed(80 points and up)

		approach		<p>criteria was weighted. Automated tools were used for evaluation. Also surveys were performed with developers of the web applications.</p>	<p>- 8 web sites were good-designed ([70,80] points) -Awareness about the standard was low</p>
2012	Yalçinkaya	Evaluation of the compliance with TÜRSAT standard with all aspects.	50	<p>-32 rules extracted from standard - A tool was developed to verify the rules defined for HTML source code - A set of rules were verified manually - Accessibility standard compliance, CSS standard compliance and XHTML transitional standard compliance was verified with Total Validator Tool</p>	<p>- Compliance ratio of public institution web sites in Turkey to TÜRSAT standard was low - Compliance ratio of public institution web sites in Turkey to International web development standard was also low. -TÜRSAT standard was out-dated, it should be updated</p>

2.2 STANDARDS FOR E-GOVERNMENT WEB APPLICATIONS

In this section, national and international web development standards are explained in detail.

2.2.1 INTERNATIONAL STANDARDS

In today's technology, there are 3 major concepts about web development that has international standards:

- ❖ (X) HTML
- ❖ CSS
- ❖ Accessibility

First one is a markup language standard, Extensible HyperText Markup Language (XHTML) 1.0 Transitional (W3C, 2000). First edition of this specification was released in 2000. Since its release, HTML standard was replaced with XHTML. In this thesis, the web pages were examined according to the second edition of this specification which was released in 2002. XHTML standard ensured the same appearance of the web page on different browsers, so it focused on design of a web page that will be executed on client-side.

Cascading Style Sheets (CSS) is a technology applicable to only files that are written with markup language. This technology's area of interest is style of the web page. Style includes indentation, colors, fonts and anything about the appearance. CSS was created by W3C and currently maintained by W3C. First specification was released in 1996. In this thesis, Turkish public institution web sites are examined in terms of style according to CSS 2.1 (W3C, 2011).

As a general opinion, measure of success of a web page or a general web application is its usability and accessibility (the studies discussed in Section 2.1 also support this claim). For this reason we examined the international standards about accessibility published. Three of the mostly preferred accessibility standards for the web applications developed in the world are:

- ❖ Web Content Accessibility Guidelines 1.0 (WCAG 1.0)
- ❖ Web Content Accessibility Guidelines 2.0 (WCAG 2.0)
- ❖ Section 508

WCAG 1.0 (W3C, 1999b) focused on improving the accessibility of a web application. The main purpose was making the web site accessible to disabled people. 14 guidelines were described and each of them had a checklist with one or more items. Checklist items were prioritized in 3 levels (1, 2, and 3). W3C also prepared a document for techniques to control each checklist item at an application. The conformity to these guidelines was determined with these checklist items.

WCAG 2.0 (W3C, 2008) could be seen as an extension of WCAG 1.0(W3C, 1999b). Again the aim was to make the web site accessible for disabled people. WCAG 2.0 included WCAG 1.0 and adapted the guidelines to new technologies. Guidelines prepared in 2008 were organized under 4 principles of web accessibility. Each principle had guidelines and each guideline had a success criteria. Each success criteria was prioritized as level A, AA or AAA. The conformity to guidelines was determined with success criteria in WCAG 2.0. In this thesis, we also checked the compatibility of the selected web sites to WCAG 2.0 standard.

U.S. government preferred to publish its own accessibility standard (U.S. General Services Adm., 1998). Section 508 was an amendment to the United States Workforce Rehabilitation Act of 1973 and prepared for usage of Federal Agencies only.

Like all other accessibility standards, motivation to prepare this standard was making the web applications accessible to people have disabilities.

2.2.2 WEB STANDARDS IN TURKEY

In this section, standards and guidelines published for public institution web site development in Turkey are explained in detail.

2.2.2.1 GUIDELINE FOR PUBLIC INSTITUTIONS WEB SITES STANDARDS AND SUGGESTIONS

TÜRKSAT (2009) has prepared a guideline for public institutions web sites. This standard is formed by taking into account international standards prepared by International Organization for Standardization (ISO), British Standards Institute (BSI), European Standardization Committee (CEN), American National Standards Institute (ANSI), European Union (EU), and W3C. This standard not only includes exact rules but also recommendations for the web sites. Standard is currently maintained by TÜRKSAT A.Ş. and has a support web site (www.kakis.gov.tr) which is publicly available. The web site includes information about basic concepts expressed in the standard, and describes the benefits of standard usage. However, this web site service is not effectively working. When we examined the existing reports of this tool, it can be said that the report is not understandable and directive enough to point out the problem and solution.

Rules listed in this standard are categorized under 21 main topics. The topics are:

- a) Usability
- b) Accessibility (For disabled people)
- c) Software & Hardware
- d) Improving the usage
- e) Main Page
- f) Page Design

- g) Navigation
- h) Scroll Bar and navigation between pages
- i) Headings
- j) Links
- k) Texts
- l) Lists/Tables
- m) Data Entry
- n) Image & Multi-Media components
- o) Search
- p) Contact
- q) Meta Data
- r) Archiving
- s) Privacy
- t) Broadcasting
- u) Tests

In the standard, every section prepared for each category includes the explanation of the rules one by one, besides the motivation for the rule and necessity of rule. Most of the rules are explained with an example (positive or negative) from a public institution web site.

The standard does not only include rules to be obeyed but also include recommendations for achieving the aim for correct design or implementation. For example, the standard proposed online tools for contrast check (Under accessibility section) or HTML validation. The main purpose of this thesis is to measure the compatibility of Turkish public institutions' web sites to this guideline.

2.2.2.2 GUIDELINE FOR INTEROPERABILITY PRINCIPLES

This guideline (Ministry of Development, 2009) is prepared for all kind of applications developed within the context of eDTr (BTD, 2003) project. The aim of this guideline is to define responsibilities, principles, common methods and criteria for public institutions to be able to work together for the same purpose easily. Interoperability which was defined as “Effective Information Sharing” in this guideline is not only necessary for internal transactions of the institution, but also for transactions between institutions.

This guideline is prepared more comprehensive than the TÜRKSAT guideline explained in Section 2.2.2.1. The rules defined in this guideline are for system level of an e-government application whereas the TÜRKSAT guideline defines them for design level. The relationship between these two guidelines could be visualized with Figure 2.2.



Figure 2.2 Relationship between Guidelines

A few samples from major topics covered by this guideline can be listed as:

- ❖ Server Capabilities
- ❖ Video & File Characteristics
- ❖ File Transfer Protocols
- ❖ Transfer and download rates
- ❖ Content Management
- ❖ Organizational Processes(such as CMMI)
- ❖ Cryptography

This list shows that, if an institution needs a web application first this guideline should be used and the infrastructure of the organization should be compliant to this standard.

After this stage is completed, the guideline of TÜRKSAT should be used for development of the application.

2.3 TECHNOLOGY BACKGROUND

In this section, the technology used in this thesis and alternative technologies to the selected ones are examined.

2.3.1 RETRIEVING FILES FROM WEB

In this thesis, the aim is to validate all web pages of a web site. For this reason, we needed a tool to retrieve all web pages of the web site. This tool should be executed with command line and also should be integrated to a program in future.

We have selected GNU Wget (Free SW Foundation, 2007) to retrieve whole web site. This tool is an open-source and free software and is easy to use. This tool is capable of recursive download as needed, and recursive download can be limited with a level. This tool is also capable of downloading dynamic web site to a static local copy.

Other popular web site retrieving programs such as Teleport Pro (Tennyson Maxwell IS, 1997) and SurfOffline (Bimesoft, 2002) are generally commercial software and are not compatible as much as Wget to the architecture of the software developed for this thesis.

2.3.2 PARSING HTML

To validate HTML and XHTML related rules, source code of web pages should be checked. For this aim a parser should be selected or developed. In this thesis an open source HTML parser is used (Sourceforge, 2006). Since the parser was developed in Java, it was easy to integrate it to the tool developed to check HTML rules.

This software library could parse the source code of a web page and iterate the tags in the file by using visitor pattern. The intent of the visitor pattern is described as “Represent an operation to be performed on the elements of an object structure. Visitor lets you define a new operation without changing the classes of the elements on which it operates” in Design Patterns book (Gamma et al., 1998). A disadvantage of this parser is that it cannot parse Java Script and CSS code. Also it cannot understand the code block in <script> tag. However in this thesis, we performed CSS file validation with another tool, and java script validation was not necessary so this parser has met the requirements.

Jericho HTML Parser is a strong alternative (Sourceforge, 2011). It is adaptive to new web technologies and could parse server-side tags. The functionality needed for this thesis could be maintained with both of the alternatives. Since Jericho HTML Parser is newly developed, it could not be bug free as much as the one developed in 2006.

2.3.3 VALIDATING WEB SITES

In this thesis, validation with software is performed in two steps; first step is performed with a tool we have developed and second step is performed with a purchased professional web site validation tool. This section is about the professional tool, the tool developed in the scope of this thesis is defined in chapter 3.

The tool for validation should have the following capabilities for this thesis:

- ❖ Validate whole web page according to W3C Accessibility Standards
- ❖ Validate whole web page according to W3C XHTML Transitional Standard
- ❖ Check for broken links
- ❖ Validate all CSS files of the web page according to W3C CSS Standard
- ❖ Should be executed from a script (needed to automate the validation)

Bobby (CAST, 1999) which is recommended by TÜRKSAT for accessibility check is no longer supported by CAST. This tool is sold to Watchfire in 2004. Today, there is not a free tool available for accessibility control named Bobby. For this reason, using Bobby is not an option for accessibility check in this study.

Total Validator Pro Tool (Total Validator, 2008) is selected for this thesis. This tool has both free version and commercial version. Free version was not able to work on command line. Therefore, professional tool was purchased and validation was performed with version 7.1.0 of this tool.

Most of the tools that could be an alternative are developed especially for one aim; link checking or CSS validation, etc. Another problem about these tools is that they validate pages one by one. W3C has its own on-line validators for its specifications (HTML validator, CSS validator). Since these tools were online and applicable to only one page at once, they do not fit the validation strategy carried in this study.

CHAPTER III

APPROACH

In this chapter, we explain the methodology followed to create the data set to perform the analysis. First, we introduce how we formed a target collection of government web sites. This collection is verified with respect to the rules in the TÜRKSAT Guideline. Since not all the rules are verifiable, we select a subset of the rules as explained in this chapter. Then, we present how the rules are checked on this target collection. We have used a commercial tool called Total Validator (Total Validator, 2008), a tool developed within the scope of this study called WSSCV, and manual verification. Figure 3.1 is an illustration of the methodology used in this research.

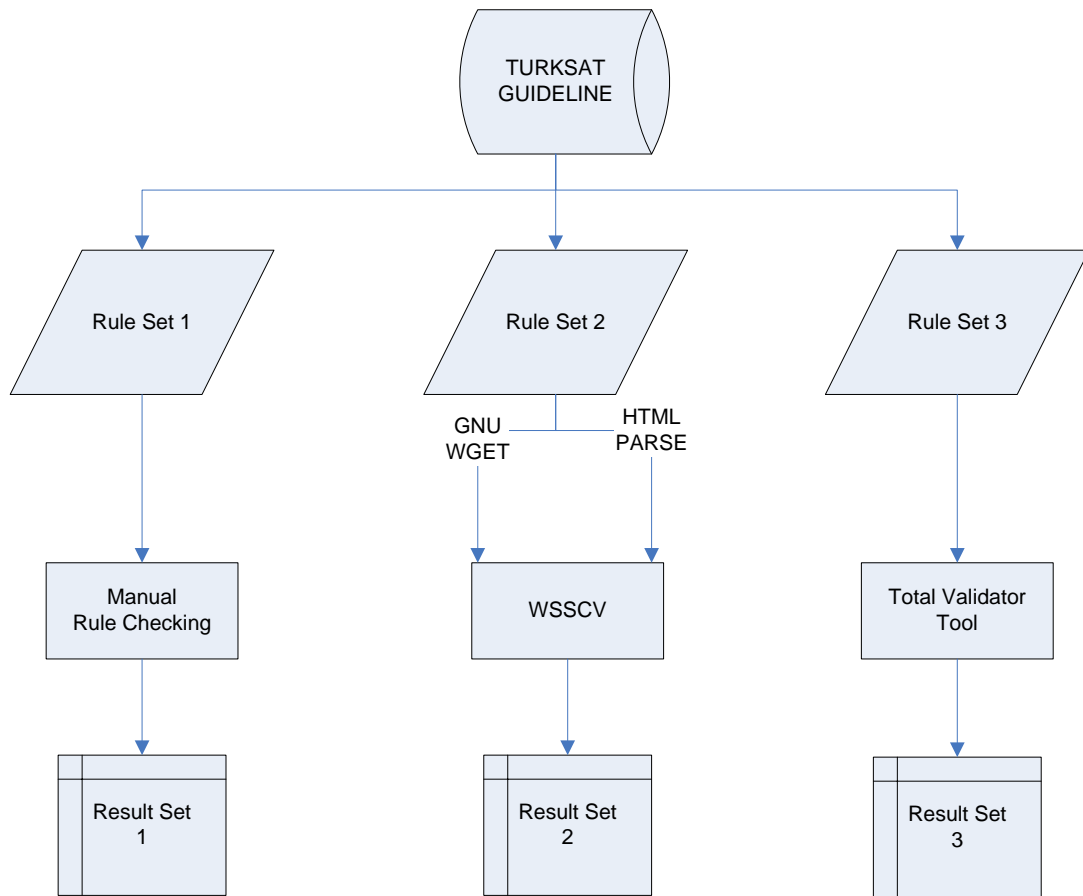


Figure 3.1 Thesis Methodology

3.1 WEB SITE SELECTION

In creating the target web site collection, our aim is to evaluate 50 public institution web sites and all of their web pages. This set should have web sites that has different characteristics; such as popular or different interest of area. During the selection of websites there are 2 mainstays. First and the most important one is the list of public institutions of Turkey published in www.turkiye.gov.tr. This is the web portal of e-government gateway of Turkey. Currently, there are 235 institution names in its list of public institution web sites.

The second mainstay is Alexa (Alexa, 2012). Alexa is a web site that collects web usage statistics around the world. In this web site, there is a list of Turkey's most visited 500 web sites. This list can change frequently. During our target web site collection creation process, only the following public institution web sites were in top 500 list.

1. www.meb.gov.tr
2. www.mgm.gov.tr
3. www.osym.gov.tr
4. www.icisleri.gov.tr
5. www.millipiyango.gov.tr
6. www.gib.gov.tr
7. www.sgk.gov.tr
8. www.dmi.gov.tr (same web site with www.mgm.gov.tr)
9. www.ibb.gov.tr
10. www.diyamet.gov.tr
11. www.ptt.gov.tr
12. www.tcmb.gov.tr
13. www.adalet.gov.tr
14. www.saglik.gov.tr
15. www.iskur.gov.tr

The list of public institutions published on e-government gateway of Turkey also includes the names listed in Alexa except www.ibb.gov.tr.

Since Alexa does not provide a formal statistics and there is no evidence about the correctness of the list, the list published on this web site can only be a guideline for our selection. We have selected 9 web sites from list of Alexa, 6 web sites are discarded because of 2 different reasons:

- ❖ www.dmi.gov.tr (same with www.mgm.gov.tr), www.diyamet.gov.tr, www.tcmb.gov.tr : These sites are very huge, containing too many files and web

pages, so that the validation of Total Validator could not be completed in 24 hours.

- ❖ www.millipiyango.gov.tr, www.ptt.gov.tr : These sites cannot be validated with Total Validator tool since the character set definition is wrong even in the home page. File cannot be parsed.

The remaining 41 web sites are selected from list in www.turkiye.gov.tr. During this selection different operating areas of public institutions are taken into account. Complete list of selected websites for evaluation is in APPENDIX C.

3.2 RULE IDENTIFICATION

TÜRKSAT Guideline consists of both objective and subjective statements. For example, “Only necessary information should be displayed on the web page” is a subjective statement and therefore it is not verifiable. For our analysis, we have created a testable rule set based on the statements in this document.

We identify 32 distinct rules from TÜRKSAT Guideline, give a unique identification number to each of them and categorize these rules according to their evaluation method.

There are three different evaluation methods used in this study:

- ❖ A tool developed in the scope of this thesis (WSSCV)
- ❖ A commercial tool named Total Validator Tool
- ❖ Manually Verification

Table 3.1 shows the rules verified with WSSCV, Table 3.2 shows the rules verified with Total Validator Tool and Table 3.3 shows the rules verified manually.

Table 3.1 Rules verified with WSSCV

Rule ID	Rule Definition
Att01	Images should be in .jpg or .gif format instead of .png format.
Att02	File and folder names should be written with lowercase.
Att03	File and folder names should not include space or special characters.
Att04	File and folder names should be shorter than 20 characters.
Att05	When mouseover event is used, onFocus event should be used too for keyboard activation
Tag01	<TITLE> should take place in the header part of the document (<HEAD>).
Tag02	Headings should be shorter than 60 characters.
Tag03	In all pages of the web site, <meta> information should be included. (No set is defined for <meta> information in the rule, tag existence is controlled)
Tag04	In all web pages; description, keyword and author should be included in header part of page.
Tag05	“Alt-Text” should be written for all images used in web page
Tag06	Alt-Text of images should not exceed 100 characters.
Tag07	Alt-Text should end with “. ” characters.(dot-space).
Tag08	Background image usage should be eliminated.
Tag09	Combo Box or drop-down menu should be used instead of radio button.
Tag10	Layout table and nested table usage should be eliminated.
Tag11	There should be row and column headers in data tables.
Tag12	Table end labels should be used.
Tag13	Cols attribute should be use in table labels.
Tag14	Each frame should have header.
Tag15	Text links should be used instead of image links.

Table 3.2 Verified with Total Validator Tool

Rule ID	Rule Definition
Gen02	Web site should be compatible with XHTML 1.0 Transitional standard.
Gen04	Web site should be compatible with CSS 2.0 standard.
Gen05	Language of the document should be specified at the beginning of the document with usage of “lang” or “xml:lang” attributes
Gen06	Web site should be compatible with W3C Accessibility standard.
Gen12	Web site should not include broken links.

Table 3.3 Rules verified manually

Rule ID	Rule Definition
Gen01	Contrast of web page should be high. (Foreground and background colors should not be close and page should be readable)
Gen03	Web site should support multi-languages.
Gen07	Main page of the web site should include many of the followings: <ul style="list-style-type: none">❖ Name and logo of institution❖ Contact Us❖ About Web Site❖ Obtain Information❖ Site Map❖ Search
Gen08	Web sites that have more than one page should have a site map.
Gen09	Bread-crumbs approach should be used.
Gen10	Password reminder mechanism should be used if it is applicable.
Gen11	Web Site should not leave cookies.

Unique identifiers of the rules are given according to the rule specification. If the rule is about an attribute of a tag, “Att“ prefix is used. If the rule is about usage of a tag, then “Tag” prefix is used. If the rule is general for whole web site, prefix is “Gen”.

Only one of these 32 rules (Gen12) is not originated from TÜRKSAT Guideline. This rule is about broken links of a website. Not only outside links, but also inside links to files or folders are checked. Although there is not an exact rule about broken links in TÜRKSAT Guideline, we add this rule to our set since it is an important property for navigation.

3.3 WEB SITE EVALUATION

In this section, we explain the methods used to evaluate a web site. Selected rule set is checked in 3 different ways.

3.3.1 WEB SITE STANDARD COMPATIBILITY VERIFIER (WSSCV)

WSSCV is a software tool developed in the scope of this thesis. 18 of our rule set are checked with this tool automatically. Rules verified with this tool are about the source

code of the web page, not the appearance, so only pure HTML source codes are verified with this tool. CSS files, script files, etc. are excluded.

Our tool is designed to iterate all possible web pages of the web site. Figure 3.2 illustrates the main workflow of WSSCV.

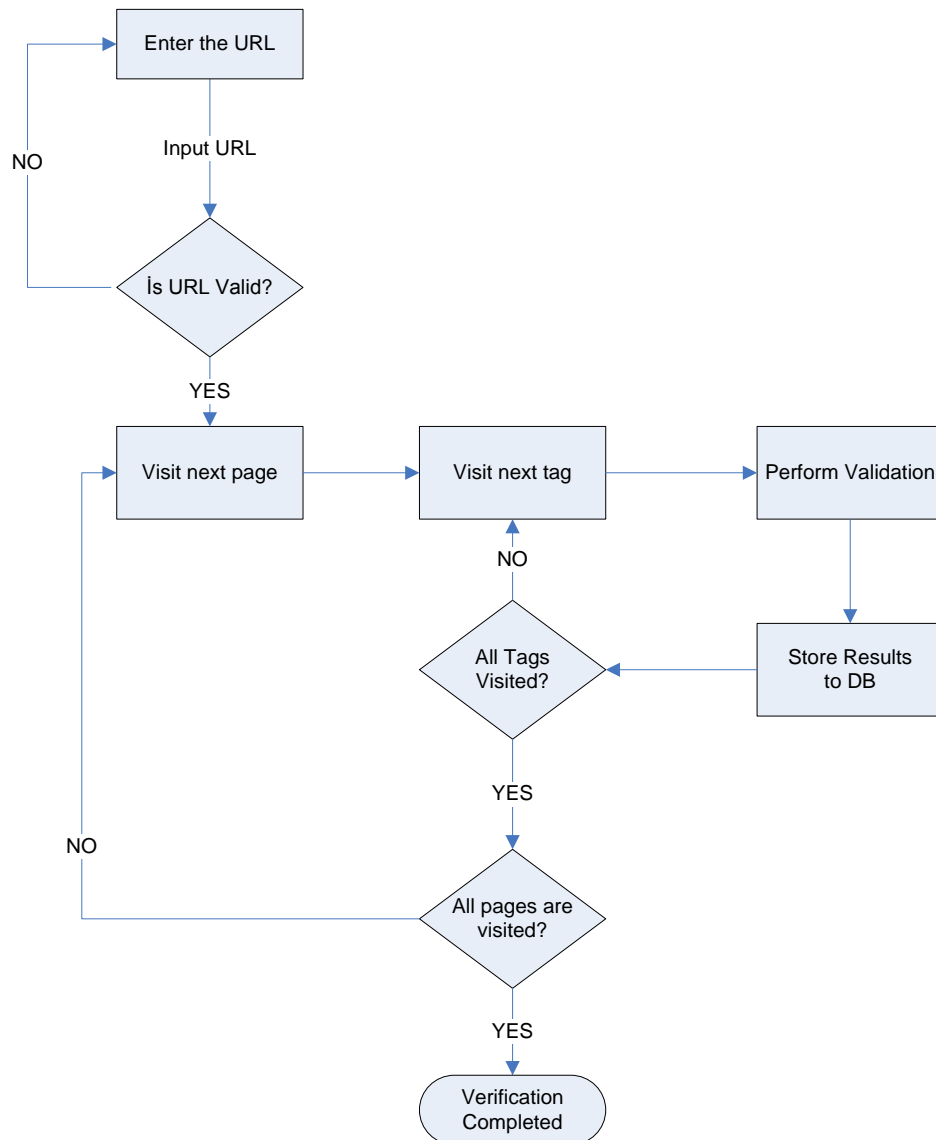


Figure 3.2 WSSCV Main Workflow

In WSSCV, evaluation of one website is a push button process. User interaction of the tool is only at point of URL entrance. When user writes the address of the website (URL) and clicks check button, evaluation starts. First step of the evaluation is URL validation; validity of URL means there is a currently broadcasting web site from the given URL.

WSSCV has a prerequisite, all source code of the website should be provided to this tool for evaluation. Website source is gathered by using Wget (See Section 2.3.1) before evaluation. The only reason of this prefetching of pages is to minimize the evaluation time since downloading all web pages of a web site is a huge time consuming operation. Wget can be integrated in WSSCV easily, if necessary.

For this thesis, we performed source download operation for all websites with execution of a python script. The script takes a text which contains the addresses of all web sites to be evaluated as input. The listing of the python script is shown in Figure 3.3. The download operation is completed approximately in 48 hours.

```
import subprocess
fileIN = open("List.txt", "r")
program = 'wget.exe --recursive --level=0 --timeout=20 --wait=2 '
while 1:
    line = fileIN.readline()
    if not line: break
    executable = program + line.strip()
    subprocess.call(executable)
fileIN.close()
```

Figure 3.3 Python Script to Download All Websites' Source Files

After the prefetching, WSSCV iterates all files one by one. Each source file is parsed with HTML Parser and each tag of each page is checked by WSSCV for defined rules. To increase the performance of WSSCV, file parsing and validating operations are divided into threads; each folder in source code of the website is validated by one thread.

An HTML source file can be seen as a tree, and the tags are the children. Therefore, HTML parser provides a smooth iteration mechanism for tags of a file using the visitor pattern.

WSSCV extends the NodeVisitor class of HTML parser and overrides the ‘visitTag’ method to implement the rule checking algorithms. visitTag method implementation is given in Figure 3.4.

```
@Override
public void visitTag(Tag incomingTag)
{
    BaseRule rule;
    //Rule Checks for attributes
    {
        rule = new AttributeRule(incomingTag);
        rule.setWebPage(webPage);
        rule.setLineNumber(incomingTag.getStartingLineNumber());
        rule.check();
    }
    //Check rules for special tags
    rule = new TagRule(incomingTag);
    rule.setWebPage(webPage);
    rule.setLineNumber(incomingTag.getStartingLineNumber());
    rule.check();
}
```

Figure 3.4 visitTag Method Implementation

Results of WSSCV are stored to a PostgreSQL(PostgreSQL GDG, 1996) database. This database has a simple architecture, there are only two tables; one table for rules and one table for the results. Rule table is manually created and the rules are defined. The result table is populated by WSSCV.

A record in the result table has the following information:

- ❖ ID: Given by database manager, Unique in result table
- ❖ Website: Evaluated website address
- ❖ Web page: evaluated web page of the website
- ❖ Rule id: Applied rule id
- ❖ Rule Violation: a Boolean field. True if the rule is violated, false otherwise
- ❖ Line Number: line number that the rule is controlled
- ❖ Column Number: Column number in the line that the rule is controlled.

Line number and column number information is added for developers to correct or address the problem. Therefore, these attributes will be excluded during result evaluation.

3.3.2 VALIDATION WITH TOTAL VALIDATOR TOOL

Total Validator Tool (Total Validator, 2008) is a commercial tool developed for web site validation (See Figure 3.5). We used this tool for validation of general rules such as CSS standard compatibility, XHTML Transitional Standard compatibility. The controls performed by total validator tool are:

- ❖ XHTML 1.0 Transitional compatibility
- ❖ CSS 2.1 Compatibility
- ❖ Broken link existence
- ❖ Accessibility Level AAA2 compatibility

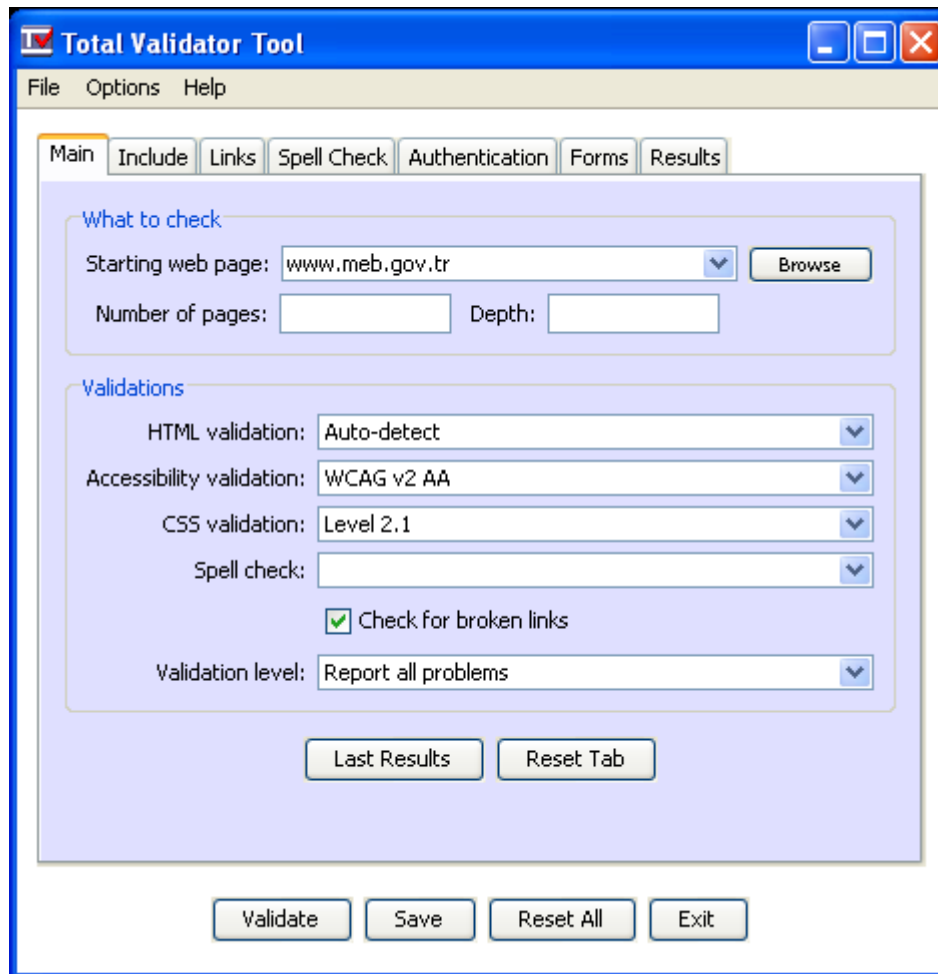


Figure 3.5 Total Validator Tool User Interface

To automate the usage of the Total Validator on all of the selected web sites, we implemented a python script listed in Figure 3.6.

```

import subprocess
fileIN = open("List.txt", "r")
program = 'TotalValidatorCL.exe -hideresults -level 2 -pages 0 -dtd "XHTML 1.0 Transitional"
-accessibility AAA2 -css 2.1 -brokenlinks -timeout 15 -resultsfolder FolderName -uniquereport'

while 1:
    line = fileIN.readline()
    if not line: break
    executable = program + ' -url ' + line.strip()
    subprocess.call(executable)
    #print(executable)
fileIN.close()

```

Figure 3.6 Python Script To Validate All Web Sites

Validation was performed for all pages of all web sites in our evaluation list. This tool produces unique reports for each web page of each web site (APPENDIX D) and also a summary page for each website (APPENDIX E). Two of the attributes given in these summary pages are total pages validated and total error numbers.

3.3.3 MANUAL VALIDATION

As shown in Table 3.3, seven of the rules that tagged as General are controlled manually. The results of the inspection with respect to these rules are stored in an Excel file. These rules are interpreted as boolean variable; true represents a violation in the rule, false represents the web site is does not violate the rule.

Six of the rules are about the content of the website. For these rules, each web site is visited and inspected manually. One of seven rules is “Contrast of web page should be high”. This rule’s validation is performed manually one by one for each website and an online tool is used for color contrast check. The contrast checking tool used is called CheckMyColours (Scala G., 2009-2012). It tries all possible background and foreground color combinations of the website and checks the contrast ratio. This tool provides a report for each web site (APPENDIX F).

This report lists the failures of each element of the website. For this thesis, validation result is a boolean variable for each website. If all web pages pass the test in checkMyColours, the result is false (rule is not violated). If there is a failure in the website, then result is true (rule is violated).

CHAPTER IV

EVALUATION RESULTS

In this chapter, we discuss the results we collected in three different ways. We collected a huge set of results (27776345 records) including all web page results of every web site retrieved with both WSSCV and Total Validator tool. However, not all of these results are examined in this chapter. We perform sampling from this huge set to analyze the results for each evaluation perspective. The result sets are examined with 4 different perspectives.

First perspective is rule based; distribution of violation ratios over the rules is examined. Second one is web site based evaluation; 50 selected public institution web sites are evaluated one by one. In this evaluation perspective only home pages of the web sites are included to result set. Since the home pages are the most visited web pages of a web site, we select the home pages of 50 selected web sites for rule based and web site based evaluation.

Third evaluation perspective is about Total Validator tool results. Total Validator tool checks a set of the selected rules that cannot be automated.

Using this tool, we ask the compatibility of Turkish public institution to international web application development standards that are referred in the TÜRKSAT guideline.

In this part, all web pages of the web sites are evaluated. In last evaluation perspective, only one web site is evaluated with its all pages. www.meb.gov.tr is selected to be evaluated since it is one of the most popular public institution web sites in Turkey according to Alexa (Alexa, 2012).

4.1 **RULE BASED EVALUATION**

The aim of this evaluation is to determine which rules are violated frequently. In rule based evaluation, 3 attributes are used for each rule; total check point count, check point count that violates the rule and check point count that the rule is not applicable(for general rules). Check point is point in the source code where the rule is applicable. Total check point count holds how many times the rule is checked in total for all validated pages. Violation count of the check points are stored as another column and last attribute column is the check point count that the rule is not applicable. There is only one rule that is not applicable for all of the web sites, Gen10. Gen10 is defined as “Web pages that needs login, should have a password reminder mechanism”. However, in the institutions that uses Microsoft Outlook web access, this capability is disabled automatically.

For a general rule, check point count is constant and one. General rules are the rules about the behavior or appearance of the web site, therefore there is only one check point for each general rule and it is the web site itself. These attribute values are collected for 32 selected rules from main pages of 50 public institution web sites. From these 3 attributes, violation ratio for each rule is calculated (See Table 4.1).

Table 4.1 Rule Based Evaluation Results

Rule	Total Check Point Count	Check Point Count that violates the rule	Check Point Count that rule is not applicable	Total Violation Ratio (%)
Att01	3149	1	0	0,03
Att02	6350	1581	0	24,90
Att03	6350	0	0	0,00
Att04	6350	700	0	11,02
Att05	756	756	0	100,00
Tag01	109	17	0	15,60
Tag02	94	2	0	2,13
Tag03	109	8	0	7,34
Tag04	109	109	0	100,00
Tag05	2565	1318	0	51,38
Tag06	1247	1	0	0,08
Tag07	1247	1247	0	100,00
Tag08	1292	3	0	0,23
Tag09	338	9	0	2,66
Tag10	1292	388	0	30,03
Tag11	1292	25	0	1,93
Tag12	1292	0	0	0,00
Tag13	1292	1292	0	100,00
Tag14	2	2	0	100,00
Tag15	4956	10	0	0,20
Gen01	50	47	0	94,00
Gen02	50	50	0	100,00
Gen03	50	26	0	52,00
Gen04	50	43	0	86,00
Gen05	50	0	0	0,00
Gen06	50	50	0	100,00
Gen07	50	9	0	18,00
Gen08	50	18	0	36,00
Gen09	50	31	0	62,00
Gen10	50	8	35	53,33
Gen11	50	44	0	88,00
Gen12	50	43	0	86,00

Check point counts of the rules are visualized in Figure 4.1. The general rules are excluded from this chart since their check point count is fixed. Each general rule has 50 check point count since they are checked only once for each web site.

Rules that have highest check point counts are the ones about file and folder names, as expected. Rule about links in the web page comes after file/folder name rules in the list of check point count (Tag15). This ranking is also expected in check point distribution. Tag14 rule has the lowest check point count; this rule is about the frames used in the web page.

Frames are individual parts in a web page, a web page can be constructed from 3 frames and each has different content. In today’s technology frame usage is not preferred since it has negative effects for search engine operations.

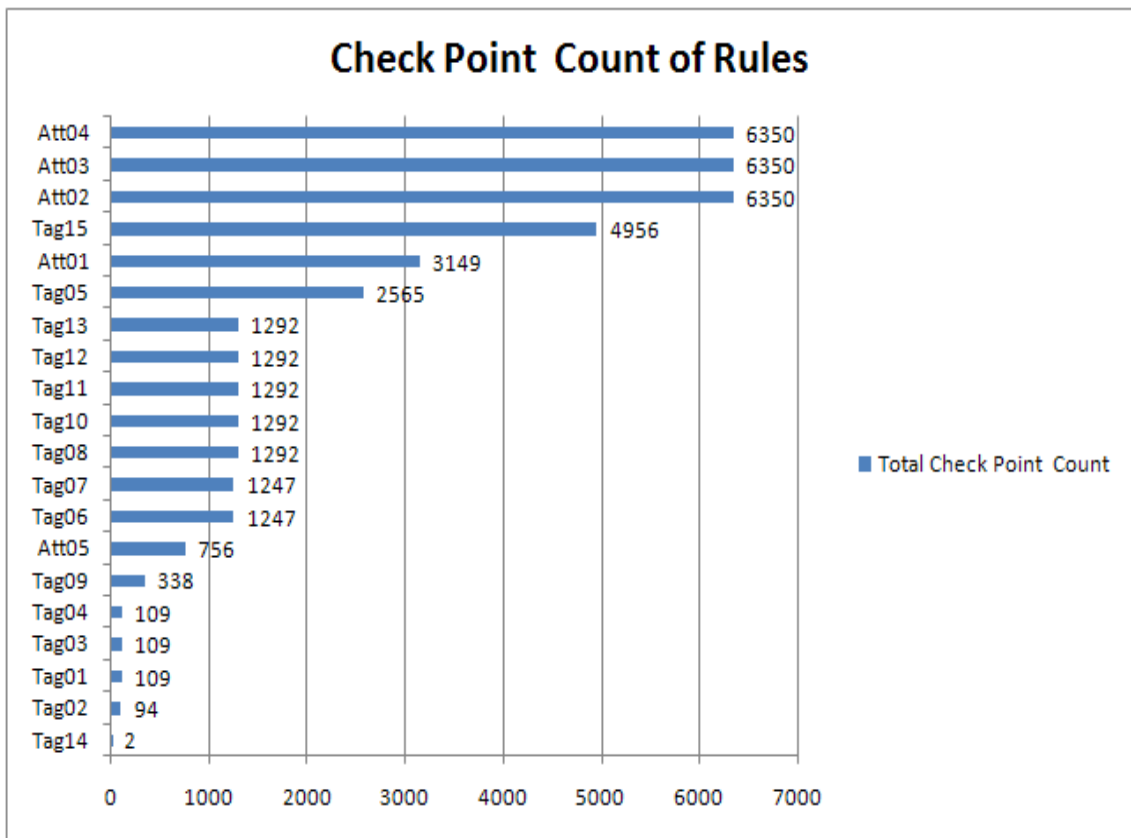


Figure 4.1 Check Point Count of Rules

According to the results in Table 4.1, general results have higher violation ratio than attribute and tag rules. The main reason of this situation is the generalization in the rules; they do not have only one condition to check as the other rules, so it is very common for these rules to be violated in a web site. For example, “Web site should be compatible with W3C Accessibility standard.” is a general rule but there can be so many points that violate this rule in a single web page. For this reason, we interpret the results of general rules and the other ones separately. Attribute and tag rules (20 rules in total) are interpreted together and general rules are interpreted separately.

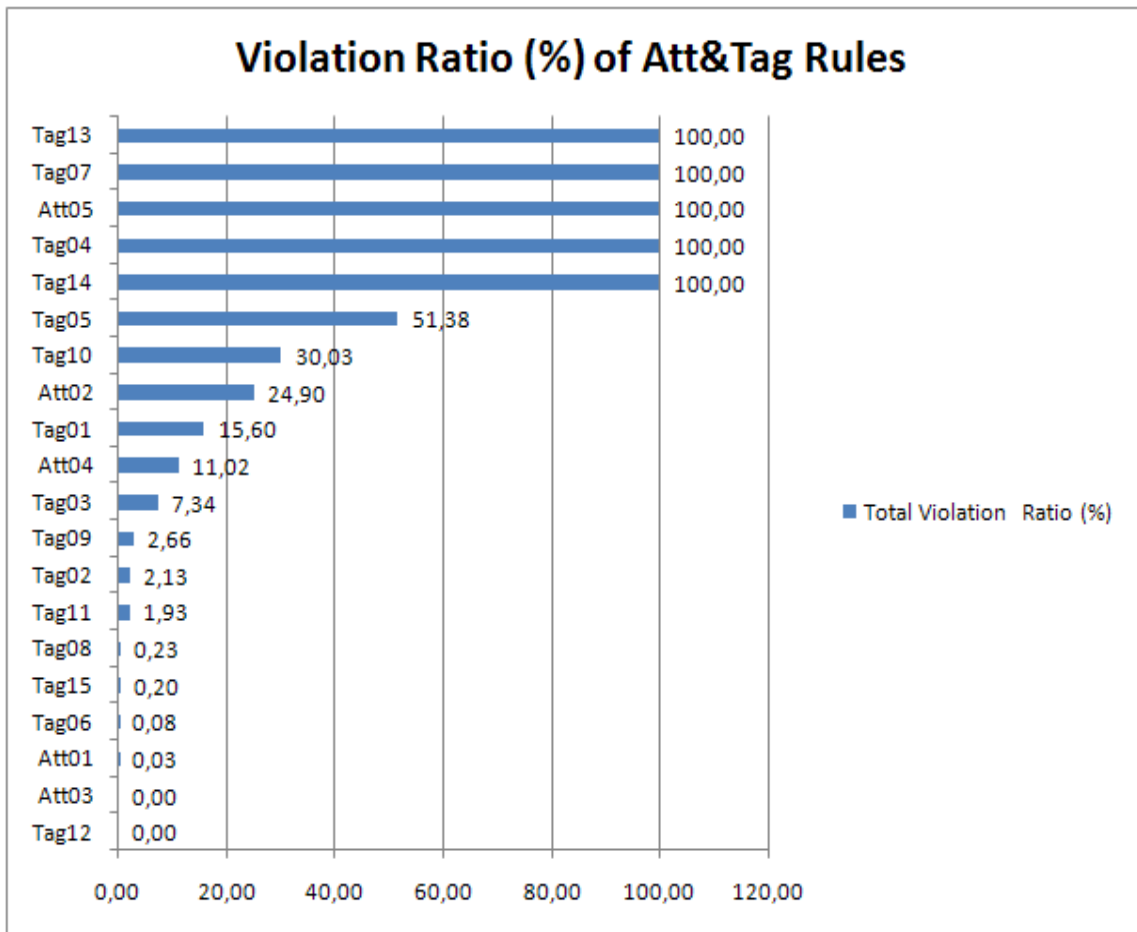


Figure 4.2 Violation Ratio of Attribute and Tag Rules

As illustrated in Figure 4.2, there are 5 rules (25% of the rule count) that are violated by every web site, and 2 rules (10%) that are violated by none of the web sites.

Tag04 rule is about having meta data in source code; each page should have author, description and keyword information under <meta> tag. Aim of the meta tag is giving information to search engines about the web page. The keywords given inside this tag are used by search engines to index the web site. In our results, Tag04 rule is violated by every web page inspected. This situation proves that placement of the web site in search results of web spiders is not a concern of the development team.

Tag07 is also violated by all controlled web pages. It is a specific rule that limits the “alt” attribute value style. According to this rule, “alt” attribute value should end with ‘.’. This condition does not cause a technical problem if it is not obeyed. However, it is necessary for good reading of the source code, and well displayed alternative text. It can be stated that this rule is ignored by web application project team since it does not have technical failure consequences.

Tag13 is defined as “Table tag should include ‘cols’ attribute”. “cols” attribute is added to make the rendering of the browser faster. If cols attribute is added to <table> tag, browser has the information how many columns will be drawn. However, even in HTML standard released at January of 1999 “cols” attribute is deprecated (W3C, 1999a), and “colgroup” is used instead. Therefore, it is an expected result for all web pages to violate this rule. The guideline of TÜRSAT (TURKSAT, 2009) should also be updated periodically, to follow the changes in the technology or standard should be generalized for this kind of rules.

Tag14 is about the frames. Frames are used to divide a web page into small pages in the same window. However, this is not a technology preferred anymore, because of its drawbacks for search engine operations. In the checked pages, frames are used rarely (only 2 checkpoints) and whenever they are used, titles are missing.

The last rule that violated by all web pages checked is Att05. Att05 is defined as “When mouseover event is used, onFocus event should be used too for keyboard activation”. Today, most of the users complete all of their operations on the web site with mouse. As supported with a 100% violation rate, capabilities in the web sites are not enabled with both mouse and keyboard.

Tag05 rule has 51% violation ratio and comes after the rules with violation rate of 100%. Tag05 is defined as “No 'alt' attribute in tag”. “alt” attribute provides an alternative text to be displayed instead of the image, if the image download is failed or slow. In today’s technology, images are downloaded in a few seconds and alternative text is not needed to be displayed in most conditions. However, this should not be an excuse for alternative text editing. All possible conditions including download failure should be taken into account.

The rules that highest violation rates (100%, 51%) show that, the standard is not considered during development for the conditions that the rules refer to. The aim of the developers is only to execute successfully and the rules such as helps indexing in the web are ignored.

Att03 and Tag12 has 0% violation rate, all checkpoints satisfy the rule condition. Att03 is about the space characters in file and folder names. This rule is written to eliminate possible web browser welded problems. Tag12 is design oriented; when this rule is not satisfied, HTML tables cannot be displayed correctly.

Rules that have low violation ratios are the ones that can cause exceptions in execution time of the application. So it is an expected result for all of the web pages to satisfy the rules to prevent run-time errors. Rule based evaluation ratios show that only best-case scenario of the web application is concerned during the development.

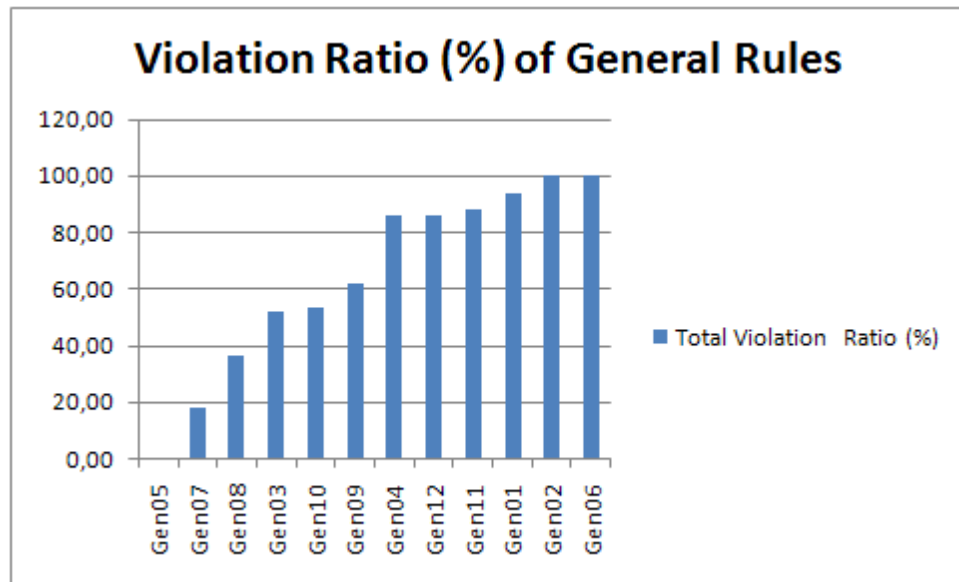


Figure 4.3 Violation Ratio of General Rules

If we look at the general rules (See Figure 4.3), there are 2 rules that are violated at every check point. One of them is CSS standard compatibility, and the other one is W3C HTML standard compatibility (Gen02, Gen06 respectively). Both of these rules have many sub rules that is not in the context of this thesis, and these rules are checked in not only the main pages of the web sites but also in the other pages. This means that a tag or attribute rule can be violated with one condition in a check point but a general rule is controlled with more than one condition in one check point.

There is only one general rule that every web page complies (Gen05). Gen05 is about the language description in each web page. Every web page should include information about the language in the HTML source. Today most of the tools used for web application development insert this information into the source code of the page; therefore, every page complies with this rule.

To summarize, 32 rules are evaluated at 50 web sites and the results showed us that the compatibility to TÜRKSAT guideline (TURKSAT, 2009) is very low. Even if we exclude Tag13 from the evaluation since the rule is outdated, the result does not change. There is a general lack of awareness about the web application standard in our country.

4.2 WEB SITE BASED EVALUATION

In this section, we evaluated web sites and examined their total rule violation ratio. The aim of this evaluation is to compare the public institutions' web sites and to identify which one is most compatible to the standards.

32 rules are checked for 50 selected web sites, rules that are not applicable for the web site are excluded. Tag13 rule is excluded for all of the web sites, since this rule is outdated (See Section 4.1 for outdated Tag13 rule). Violation ratio is calculated for each individual web site by using, rule count, rule count that are not applicable and violated rule count.

This result set depends on the merge of general rule check results and WSSCV results of main pages of 50 selected web sites. For this evaluation, only rules that are violated considered. How many times the rule is violated for each web site is ignored. The results are presented in Table 4.2.

Table 4.2 Web Site Based Evaluation Results

Web Site	Rules that are not applicable	Violated Rule Count	Violation Ratio (%)
www.saglik.gov.tr	2	9	30,00
www.devoperabale.gov.tr	1	10	32,26
www.dhmi.gov.tr	2	11	36,67
www.dsi.gov.tr	2	11	36,67
www.meb.gov.tr	1	12	38,71
www.aile.gov.tr	2	11	36,67
www.kultur.gov.tr	2	11	36,67
www.sgk.gov.tr	2	11	36,67
www.icisleri.gov.tr	1	12	38,71
www.osym.gov.tr	1	12	38,71
www.atk.gov.tr	2	12	40,00
www.botas.gov.tr	2	12	40,00
www.gib.gov.tr	2	12	40,00
www.tbmm.gov.tr	2	12	40,00
www.ysk.gov.tr	2	12	40,00
www.adalet.gov.tr	2	13	43,33
www.cem.gov.tr	2	14	46,67
www.devtiyatro.gov.tr	2	13	43,33
www.ebk.gov.tr	1	14	45,16
www.myk.gov.tr	1	14	45,16
www.vgm.gov.tr	1	14	45,16
www.aoc.gov.tr	2	14	46,67
www.basbakanlik.gov.tr	2	14	46,67
www.denizcilik.gov.tr	2	15	50,00
www.igb.gov.tr	2	14	46,67
www.ihale.gov.tr	2	15	50,00
www.tdk.gov.tr	2	14	46,67
www.tuketici.gov.tr	2	14	46,67
www.dmo.gov.tr	1	15	48,39
www.turkiye.gov.tr	1	15	48,39

Table 4.2 (continued)

www.yargitay.gov.tr	1	15	48,39
www.devletarsivleri.gov.tr	2	14	46,67
www.dpb.gov.tr	2	15	50,00
www.kanser.gov.tr	2	15	50,00
www.toki.gov.tr	2	15	50,00
www.iskur.gov.tr	1	16	51,61
www.jandarma.gov.tr	1	16	51,61
www.ua.gov.tr	1	16	51,61
www.afetacil.gov.tr	2	16	53,33
www.anayasa.gov.tr	2	16	53,33
www.asal.msb.gov.tr	2	16	53,33
www.ayk.gov.tr	2	16	53,33
www.ibb.gov.tr	2	16	53,33
www.kyk.gov.tr	2	16	53,33
www.maliye.gov.tr	2	16	53,33
www.caykur.gov.tr	1	17	54,84
www.akmb.gov.tr	2	17	56,67
www.bayindirlik.gov.tr	2	17	56,67
www.enerji.gov.tr	1	18	58,06
www.atam.gov.tr	2	18	60,00
Average Violation Ratio: 46,40%			

There is no web site that compliant with all of the selected rules. Besides, the average violation ratio of the web sites is 46.40%. This ratio shows that awareness of using TÜRKSAT guideline is not enough yet.

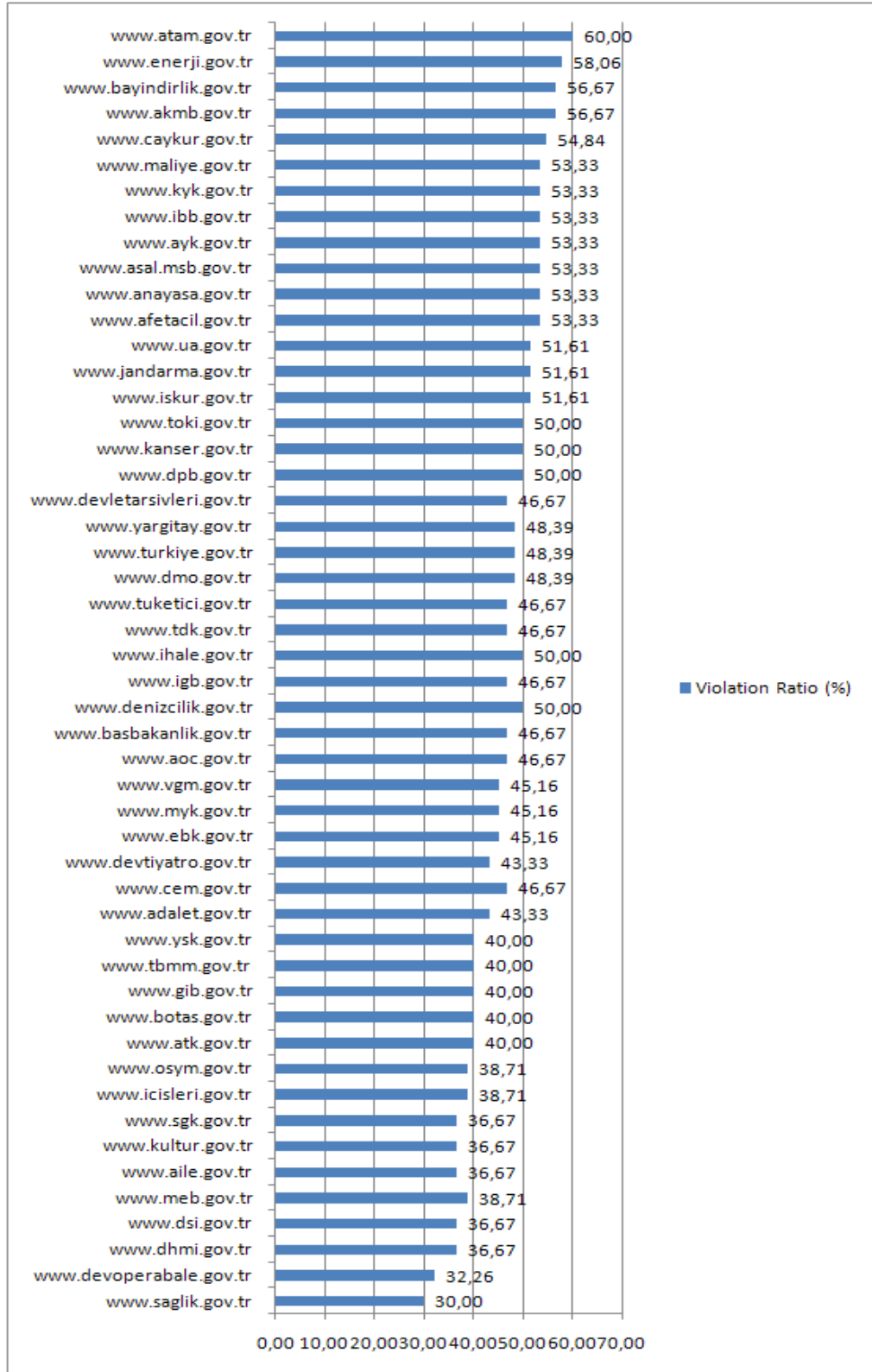


Figure 4.4 Web Site Based Evaluation Results

In this evaluation perspective, the web site of Ministry of Health is the highest standard compliant site in the set of 50 selected web sites. It has the lowest violation ratio with 30.00%. The worst violation ratio in the list (60.00%) belongs to web site of Atatürk Research Center (www.atam.gov.tr). For this website only one rule is not applicable and 18 of 30 rules are violated.

www.meb.gov.tr has 38.71% violation ratio and it is in the top 10 standard compliant sites. On the other hand www.ibb.gov.tr has 53.33% violation ratio and it is in the worst 10 list. Both of these web sites are in most visited 500 Turkish web sites list of Alexa. This difference shows that, the hit count of the web site does not depend on its development quality.

Another striking point is www.turkiye.gov.tr. This web site is the entry point of e-government applications in Turkey. Every e-government application can be reached over this web site. This site's violation ratio is 48.39%. Even in the most important web site of the government the standards and the guidelines are not considered. Besides, www.turkiye.gov.tr is developed by TÜRKSAT A.Ş.. It is obvious that TÜRKSAT does not conform to its standard.

To summarize, none of the selected web sites are fully compliant with the standard (TÜRKSAT, 2009) and the average violation ratio is 46.40%. In average 15 of 32 rules are violated in each public institution web site. This result raises other important questions; "Is TÜRKSAT's standard correct and applicable? Are standards really disregarded in public institution web sites?" . To answer these questions, we analyze our selected public institution web sites in terms of compatibility to international web development standards in section 4.3.

4.3 TOTAL VALIDATOR RESULTS BASED EVALUATION

We evaluated the web sites according to the rules extracted from our national public institution web sites standard of TÜRKSAT in section 4.1 and 4.2. W3C and CSS standards compatibility are also rules (general rule) written in this standard.

In this section, we are looking for the answer to “Are Turkish public institution web sites developed as compatible to international web application development standards?”. We evaluate the results of Total Validator tool. Total Validator tool is executed for 50 selected web pages. Every page of each web site is checked with this tool. The tool is configured to check the following international standards in the web pages:

- ❖ Accessibility : AAA2
- ❖ CSS : 2.1
- ❖ (X)HTML validation: XHTML 1.0 Transitional

As an additional check, broken link control is performed. The tool is configured to report only errors (warnings are excluded). The results of the tool execution are given in Table 4.3.

Table 4.3 Total Validator Tool Results

Web Site	Total Pages Checked	Total Links Checked	Total Pages with Problem	Total Errors Found	Erroneous Page Ratio (%)
www.ayk.gov.tr	10	141	1	212	10
www.tbmm.gov.tr	8416	11114	1064	1656063	12,64
www.gib.gov.tr	20	49	8	1015	40
www.devoperabale.gov.tr	2	37	1	6	50
www.ysk.gov.tr	131	967	84	121679	64,12
www.caykur.gov.tr	782	1912	562	488509	71,86
www.botas.gov.tr	15	58	12	302	80
www.aoc.gov.tr	29	332	27	8616	93,10
www.enerji.gov.tr	370	933	354	21739	95,67
www.adalet.gov.tr	919	6316	886	121643	96,41
www.cem.gov.tr	279	1784	271	21260	97,13
www.iskur.gov.tr	42	116	41	5272	97,62

Table 4.3 (continued)

www.dpb.gov.tr	318	2345	311	67767	97,80
www.ihale.gov.tr	46	568	45	3194	97,82
www.afetacil.gov.tr	473	1422	463	54824	97,88
www.atk.gov.tr	76	1091	75	9054	98,68
www.anayasa.gov.tr	997	1680	987	842350	98,99
www.toki.gov.tr	504	1491	499	53787	99,01
www.maliye.gov.tr	121	761	120	19284	99,17
www.kanser.gov.tr	247	720	245	21640	99,20
www.ebk.gov.tr	1013	2832	1005	150314	99,21
www.vgm.gov.tr	273	1237	271	41843	99,26
www.denizcilik.gov.tr	149	409	148	45220	99,32
www.myk.gov.tr	2645	6996	2632	49529	99,50
www.tdk.gov.tr	1046	1611	1041	122822	99,52
www.akmb.gov.tr	920	3033	916	563884	99,56
www.dhmi.gov.tr	232	1095	231	7319	99,56
www.dsi.gov.tr	1011	1897	1007	89729	99,60
www.kyk.gov.tr	23383	24034	23291	176889	99,60
www.meb.gov.tr	4759	13196	4752	318277	99,85
www.bayindirlik.gov.tr	1643	6763	1641	520824	99,87
www.icisleri.gov.tr	4779	17980	4774	896804	99,89
www.atam.gov.tr	1172	2179	1171	929604	99,91
www.ua.gov.tr	1654	5162	1653	438762	99,93
www.jandarma.gov.tr	2327	5911	2326	299693	99,95
www.devtiyatro.gov.tr	6169	10160	6168	738908	99,98
www.aile.gov.tr	288	1036	288	15211	100
www.asal.msb.gov.tr	68	181	68	23219	100
www.basbakanlik.gov.tr	1	14	1	117	100
www.devletarsivleri.gov.tr	40	449	40	24382	100
www.dmo.gov.tr	32	223	32	3554	100
www.ibb.gov.tr	63	762	63	26843	100
www.igb.gov.tr	1	15	1	86	100
www.kultur.gov.tr	1	97	1	122	100
www.osym.gov.tr	1	63	1	126	100
www.saglik.gov.tr	1	125	1	116	100
www.sgk.gov.tr	1	124	1	240	100
www.tuketici.gov.tr	103	269	103	36864	100
www.turkiye.gov.tr	2877	5714	2877	80961	100
www.yargitay.gov.tr	54	443	54	8407	100
Total	70503	147847	62614	9128885	88,81

Total Validator tool checked 70503 pages in total from 50 different web sites (See Table 4.3). Total error number identified in all of these pages is 9128885. Among these 70503 pages, 88.81% of them include at least one error.

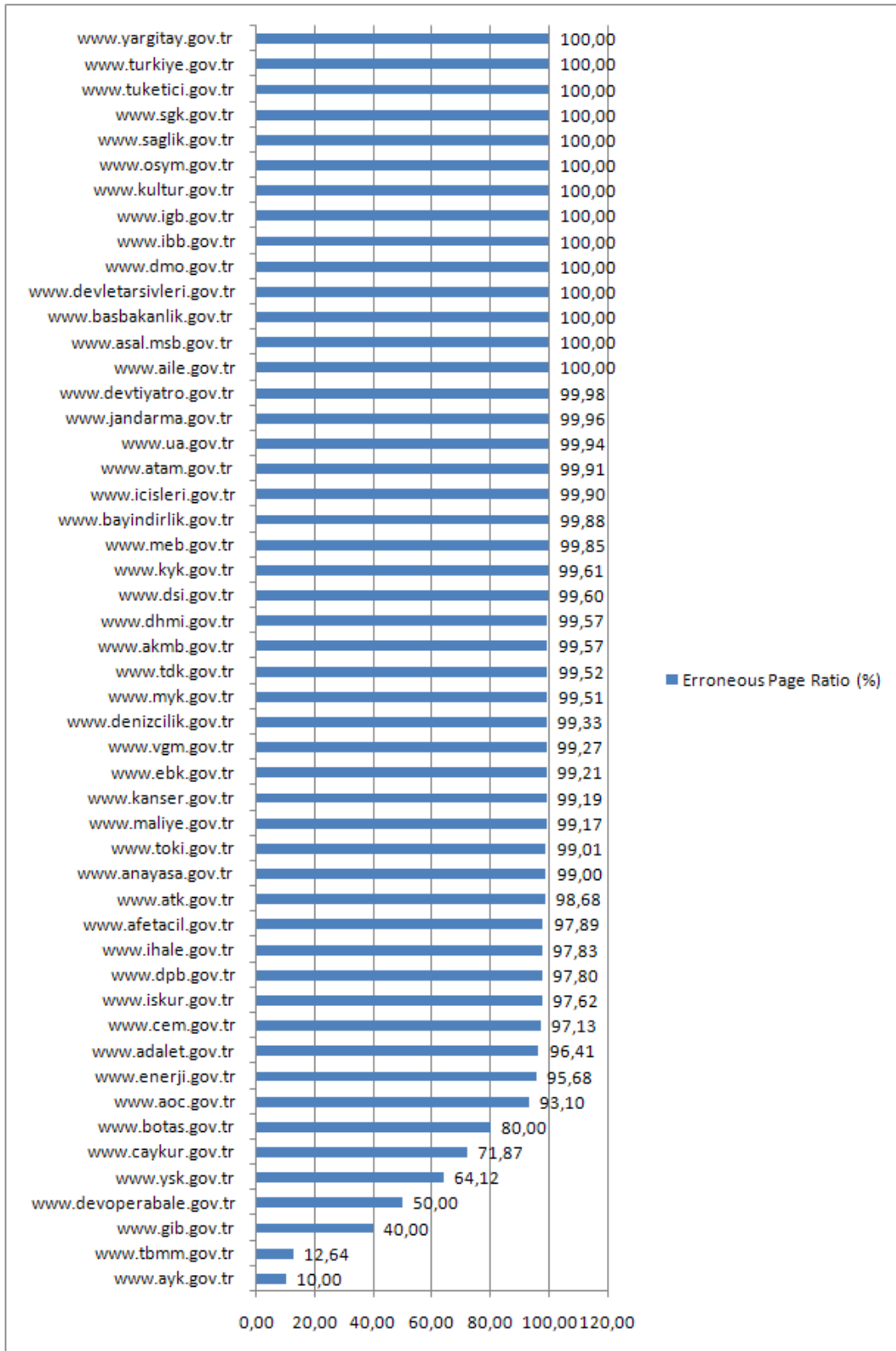


Figure 4.5 Web Sites Erronous Page Ratio

When we examine the web pages of each sites, there is no web site without an error. Moreover, there are 43 web sites that have a violation ratio above 90%. In this list, the best web site seems to be www.ayk.gov.tr with 10% violation ratio.

Some of the web sites where every page includes at least one error (100% erroneous page ratio) are in the top 500 list of Alexa. Although www.asal.msb.gov.tr is not in the list of Alexa, we can say that this web site is one of the most popular public institution web sites in Turkey because of the military obligation of male citizens. The web site of ÖSYM is another example. Although it is not in the list, we know that each student in this country visit this page. Again we can reach to the following statement from these inputs; there is no relationship between the development quality of the web application and the hit count of the web site.

Total Validator tool results support our results presented in Section 4.1 and 4.2. Public institution web sites in Turkey do comply with neither national nor international standards.

4.4 SPECIFIC WEB SITE EVALUATION

In this section, we evaluate the standard compatibility more specifically. Only one web site is checked with its all web pages by WSSCV. Web site of Ministry of Education (www.meb.gov.tr) is selected for evaluation since it is the most used public institution web site of Turkey according to the list of Alexa. In Table 4.4, results for the web site are given. The rule Tag13 is excluded from the results table since it is an outdated rule.

Table 4.4 www.meb.gov.tr Evaluation Results

Rule	Check Point Count	Violated Check Point Number	Violation Ratio (%)
Att01	1659	0	0,00
Att02	6391	644	10,08
Att03	6391	0	0,00
Att04	6391	79	1,24
Att05	607	607	100,00
Tag01	346	0	0,00
Tag02	346	4	1,16
Tag03	346	1	0,29
Tag04	346	346	100,00
Tag05	1395	1272	91,18
Tag06	123	0	0,00
Tag07	123	123	100,00
Tag08	1314	0	0,00
Tag09	353	0	0,00
Tag10	1314	498	37,90
Tag11	1314	0	0,00
Tag12	1314	0	0,00
Tag14	30	28	93,33
Tag15	4183	0	0,00
Gen01	1	1	100,00
Gen02	1	1	100,00
Gen03	1	0	0,00
Gen04	1	1	100,00
Gen05	1	0	0,00
Gen06	1	1	100,00
Gen07	1	0	0,00
Gen08	1	0	0,00
Gen09	1	0	0,00
Gen10	1	1	100,00
Gen11	1	1	100,00
Gen12	1	1	100,00

WSSCV is a tool developed to check attribute and tag rules in the web sites. General results are controlled with Total Validator tool and also manual verification. The following numbers are from the WSSCV reports:

- ❖ Total Controlled Check Point Number : 34286
- ❖ Total Controlled Page Number : 5745
- ❖ Total Violated Check Point Number : 3602

Violation ratio for this 34286 check point is 10.50%. This ratio is not low enough but it is also not so high according to the other evaluation results. We can say that there is no single web page in the entire web site that does not include an error.

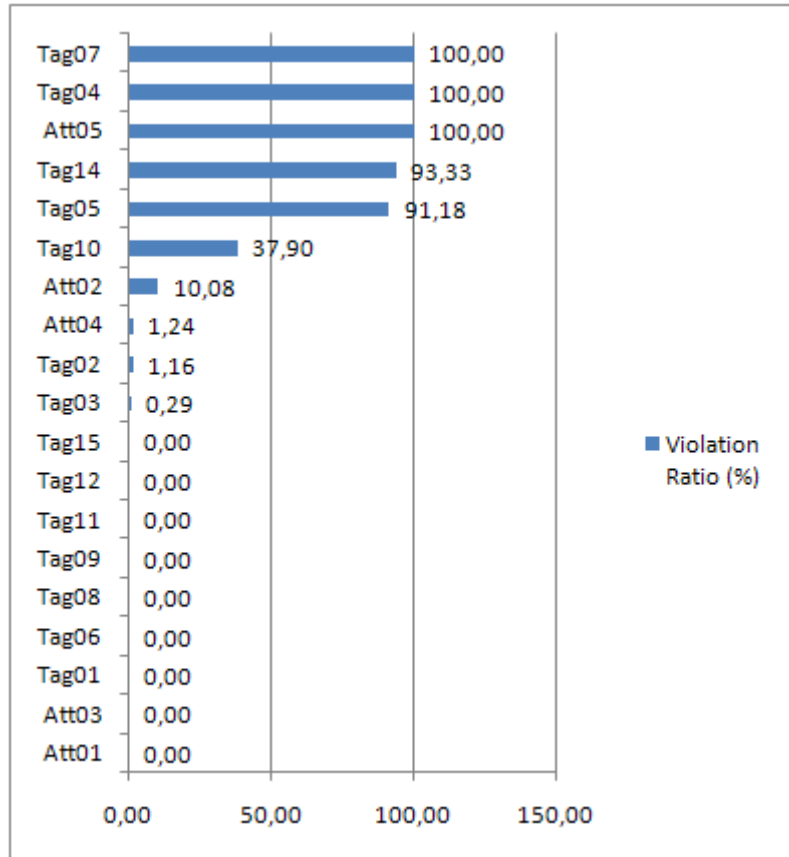


Figure 4.6 www.meb.gov.tr Rule Violation Ratios

In Figure 4.6, general rules are excluded, because a single web site only has one check point for a general rule. Since we evaluate the erroneous *page* ratios, compatibility of the web site of Ministry of Education to general rules is evaluated separately.

When we examine the most violated rules, we encounter the same situation with the rule based evaluation perspective. Top 5 violated rules are the same as Section 4.1. This result supports the inferences performed in Section 4.1.

Only 5 of 12 general rules are not violated by www.meb.gov.tr; Gen03, Gen05, Gen07, Gen08, Gen09. Gen03 is about multi-language support of the web site. The web site supports English so the rule is not violated. Gen05 is also about the language information in the source code.

Today, tools used for web application development automatically insert language information into the source code of the page, so it is an expected result that web site complies with this rule.

Gen07 defines the links that the main page of the web site should have. Gen08 and Gen09 are rules about navigation in the web site. Site map existence and bread-crumbs usage is expected in the web site. www.meb.gov.tr complies with both of these navigation rules.

Although www.meb.gov.tr is not fully compliant with the rule set selected from TÜRKSAT standard, it has a low violation ratio according to most of the other selected websites.

CHAPTER V

DISCUSSION

In the literature there is no publicly available tool for evaluating public institution web sites in terms of TÜRKSAT standard. The methodology we used in this thesis is a new perspective for public institution web site evaluation. With this study, we developed a tool (WSSCV) to verify a public institution automatically. This tool is quite extensible for adding new rules to verify and to integrate other applications such as Total Validator tool. Therefore, it is the main contribution of this thesis to the literature.

In the literature, evaluations of public institution web sites were performed with many different methods. Akıncı and Çağiltay (2004) do not use any tool for usability check, and observed the participants' behavior for evaluation. T.R. Court of Auditors (2006) evaluated 32 web sites with 8 participants. Participants are expected to give scores to web sites according to the criteria defined by Court of Auditors. Alır et al. (2007) uses automated accessibility tool and also manual verification. Kaygısız (2011) uses the same methodology with Alır et al. (2007), both automated accessibility tool and manual verification. Durmuş (2012) uses both an automated tool and also performed questionnaire with web application developers. In our study, we minimize the human interaction during the web site evaluation.

Manually verified rules are the ones which have exact answers and cannot change up to person (See Table 3.3). There are rules which can be automated in this list. However, they are implemented in different ways in different web sites. For example web site map existence can be automatically controlled but site map can be linked as site map, site tree, contents, etc. Remaining 27 rules of 32 are verified automated.

According to the results of this thesis, neither design nor implementation of a public institution web site is performed compliant with national or international standards. The study revealed that, in Turkey there is only one concern for a public institution web site; to execute successfully. Although similar results with related works conducted in Turkey are majority, there are also some conflicting results.

Kaygısız (2011) evaluates 4 public institution web sites. Accessibility and operating system compatibility are checked for these web sites. According to the results of this evaluation contrast is a general issue for all of these web sites. Contrast of the colors used in web sites is not compliant with accessibility rules. In our study contrast of the selected web sites is defined as a rule (Gen01) and the violation ratio of this rule is 94%. This ratio supports the statement of Kaygısız (2011).

Durmuş (2012) evaluates 33 public institution web sites in terms of user-centered approach. Durmuş (2012) states that the awareness about TÜRSAT standard is low and the compliance to this standard is not enough. Our results also support these statements. However, when the ranking of the selected web sites is examined; there are some conflicts. With the criteria controlled, www.turkiye.gov.tr is the most compatible web site among selected 33 web sites according to Durmuş's study. However, in our study www.turkiye.gov.tr is not even in top 10 list according to web site based evaluation results. Its violation ratio is 48.39%.

In our study, there is not a special topic focused on such as accessibility or usability. We select rules from different categories defined in TÜRKSAT standard and develop a tool that is capable of verifying all of them at once.

Currently, there is no study in Turkey questioning the applicability and correctness of TÜRKSAT standard. The results of rule based evaluation in our study show that the standard is applicable but not correct according to today's web development technology. Fifth version of this standard was published in 2006. Since 2006, many technologies are developed and many updates are performed on current ones. TÜRKSAT standard should be updated periodically to catch technical developments in web application development area.

CHAPTER VI

SUMMARY & CONCLUSION

In this thesis, we examined the compatibility of public institution web sites to standard and guideline published by TÜRKSAT. This standard includes both objective and subjective rules. We selected a set of rules (32 rules) from the objective ones and verified them. Three different methodologies were used to check these rules completely. For analysis, 50 public institution web sites were selected.

We sampled the collected results to evaluate since the whole result set was very huge. Results collected were examined from 4 different perspectives; we performed rule based evaluation to the results of the home pages of 50 selected web sites. Second evaluation was performed web site based; rule violation ratio of each web site was calculated. Third evaluation was performed with the results of a professional tool named Total Validator. We used this tool for 2 different aims in this thesis; first to validate a set of general rules we selected from the guideline, second was to support the statements that we reached by our result evaluation.

According to the results, our public institution web sites generally did not comply with the standard of TÜRKSAT. To make sure that our results were consistent, we verified these web sites completely with Total Validator tool according to the international web development standards.

This tool was executed on 50 web sites, and all pages of these web sites were checked. Results of Total Validator tool were worse than the results we collected according to our rules. There was no single web page in any web site that did not include an error.

Last evaluation was performed on only web site of Ministry of Education. All web pages of www.meb.gov.tr were validated with WSSCV and the violation ratio of each rule was calculated one by one.

First inference for these experiments is about the compliance to the TÜRKSAT standard. In general, compliance of public institution web sites to TÜRKSAT guideline is low. Especially web site based evaluation results support this statement with average 46.40% violation ratio.

Second inference is based on web site based evaluation results. Violation ratio of www.meb.gov.tr is 38.71% and 53.33% for www.ibb.gov.tr. One of these 2 web sites is in the top 10 standard compliant sites of our selected web site list. Other one is in the worst 10 list. Also these two web sites are in most visited 500 Turkish web sites list of Alexa. This difference between their placement in the list and their violation ratios shows that, the hit count of the web site does not depend on its development quality.

Third inference in our list is the most striking one. TÜRKSAT is also responsible from development of www.turkiye.gov.tr. This web site is the entry point of e-government applications in Turkey, and violation ratio for this application is 48.39%.

Even in this web site, the standard is not considered. The most important point of this result is the low compliance of TÜRKSAT A.Ş. to its own standard.

Next inference is related to international web development standards. Compliance of public institution web sites to international W3C standards is lower than the compliance to TÜRKSAT guideline. Average violation ratio for international standard (XHTML Transitional, W3C CSS, W3C Accessibility) compliance of our selected 50 web sites is 88.81%.

Public institution web sites do not comply with both national and international web development standards. Obviously, there is a lack of awareness about the standards and the importance of standard compatibility. To decrease these violation ratios, organizations responsible with web application development of public institutions should be audited about standard awareness and compatibility.

Next inference is directly related to the TÜRKSAT standard. We discovered that one of the rules that we verified is not applicable in today's web development technology. The rule is about 'cols' attribute usage in table tag; "Table tag should include 'cols' attribute". However, colgroup attribute is used instead of this attribute today. To overcome this situation, TÜRKSAT standard needs to be updated periodically to catch the changes in web technology, or the rules should be written generally.

Last inference is about the development of public institution web sites. In most of the public institution web site applications, best-case scenario is considered. For example, alternative texts to display in failure condition of image download operation are missing in most of the web sites. However, file and folder names do not include space characters as it should be, since the browsers can operate differently for space character.

6.1 FUTURE WORK

The studies presented for main objective of this thesis are designed and developed in a way not only to reach the goal but also to serve any other studies in future. Therefore, this thesis can be considered as a milestone for the next studies in this concept. The future studies based on the results presented in this thesis, or based on usage of the WSSCV can be listed as follows:

- ❖ The WSSCV which is a tool developed in context of this thesis is quite extensible; new rules can be selected from the standard and added to the WSSCV.
- ❖ The scripts that developed to download and validate web sites can be integrated into WSSCV tool so that to check the compatibility of the web site with only one tool.
- ❖ Rules collected in this thesis can also be interpreted by weighting or scoring the rules.
- ❖ All data (all web page results of all web sites selected) collected in the context of this thesis, can be interpreted with data mining tools to perform a statistical study.
- ❖ An interview can be organized with the firms that develop the web applications of the selected 50 web sites, in this interview the results collected in the context of this thesis can be examined with development team. The root cause of incompatibility to the standards can be uncovered.
- ❖ Results of Total Validator Tool can be evaluated one by one for each web site, and clustering can be performed on this results.
- ❖ WSSCV can be adapted to mobile e-government applications.
- ❖ A maturity level can be defined for public institutions with cooperation of TÜRKSAT. Web sites can be categorized according to this maturity level.

REFERENCES

- Abanomy, A., Al-Badi, A., & Mayhew, P. (2005). e-Government Website Accessibility: In-Depth Evaluation of Saudi Arabia and Oman. *The Electronic Journal of e-Government*, 3(3).
- Akıncı, D., & Çağiltay, K. a. (2004). *Kimin için E-devlet, Vatandas mi Web Tasarimcisi mi? E-devlet Websitelerinin Kullanilabilirlikleri*. Paper presented at the TBD 21. Ulusal Bilişim Kurultayı.
- Alexa. (2012). Top Sites in Turkey. 2012, from <http://www.alexa.com/topsites/countries/TR>
- Alır, G., Soydal, R., & Öztürk , Ö. (2007). *Türkiye'de E-Devlet Uygulamaları Kapsamında Kamu Kurumlarına Ait Web Sayfalarının Değerlendirilmesi*. Paper presented at the Symposium on Information Management in the Changing World, Ankara.
- Bimesoft. (2002). SurfOffline. Retrieved October, 2011, from <http://www.surfoffline.com/>
- BTD. (2003). E-DÖNÜŞÜM TÜRKİYE PROJESİ. 2011 - 2012, from <http://www.bilgitoplumu.gov.tr/Portal.aspx?value=UE9SVEFMSUQ9MSZQQUdFSUQ9MTUwJIBBR0VWRVJTSU9OPS0xJk1PREU9UFVCTEITSEVEX1ZFUIINJT04=>
- CAST. (1999). Bobby. from <http://www.cast.org/learningtools/Bobby/index.html>
- Connolly, R., Bannister, F., & Kearney, A. (2010). Government website service quality: a study of the Irish revenue online service. [Article]. *European Journal of Information Systems*, 19(6), 649-667.

Corporation, W. (2003-2004). Watchfire WebXACT. Retrieved June 13, 2011, from http://www.w3c.hu/talks/2006/wai_de/mate/watchfire.html

Delorie, D. (2004). Lynx Viewer. from <http://www.delorie.com/web/lynxview.html>

Ministry of Development, T.R.. (2009). *e-Dönüşüm Türkiye Projesi Birlikte Çalışılabilirlik Esasları Rehberi*. Retrieved from http://www.bilgitoplumu.gov.tr/Documents/1/Yayinlar/090228_BirlikteCalisabilirlikEsaslariv2.pdf.

Durmuş, S. (2012). *USER-CENTERED DESIGN APPROACH IN E-GOVERNMENT APPLICATIONS*. Middle East Technical University, Graduate School Of Informatics.

Erigami. (2007). Truwex Online 2.0: Section 508 and WCAG Accessibility, Privacy, Quality Assurance Tool. 2012, from <http://checkwebsite.erigami.com/accessibility.html>

Foundation, F. S. (2007). GNU Wget (Version 1.11.4).

Gamma, E., Helm, R., Johnson, R., & Vlissides, J. (1998). *Visitor Design Patterns: Elements of Reusable Object-Oriented Software* (pp. 431): Addison-Wesley Professional.

Garcia, A. C. B., Maciel, C., & Pinto, F. B. (2005). A quality inspection method to evaluate e-Government sites. *Electronic Government, Proceedings, 3591*, 198-209.

GDG, T. P. (1996). PostgreSQL. Retrieved October, 2011, from <http://www.postgresql.org/>

General Services Administration, U. S. (1998). Section 508 Standards Guide.

Henriksson, A., Yi, Y., Frost, B., & Middleton, M. (2006). *Evaluation instrument for e-government websites*. Paper presented at the Internet Research 7.0: Internet Convergences, Brisbane, Australia.

- Hong, S., Katerattanakul, P., & Joo, S. J. (2007). Evaluating government website accessibility: A comparative study. [Article]. *International Journal of Information Technology & Decision Making*, 7(3), 491-515.
- HTML Parser. (2007). Retrieved June 16, 2011, from <http://htmlparser.sourceforge.net/>
- Kaygısız, E. G. (2011). *Kamu Kurumları İnternet Siteleri Standartlarına göre Milli Eğitim Bakanlığı, Milli Kütüphane, İstanbul Belediyesi, Ankara Valiliği internet sitelerinin Bilgi Sunma Etkinliklerinin Türkiye.gov.tr ile karşılaştırılması*. Paper presented at the INTERNATIONAL CONFERENCE ON KNOWLEDGE, ECONOMY & MANAGEMENT, Sarajevo-Bosnia & Herzegovina.
- Kuzma, J. M. (2010). Accessibility design issues with UK e-government sites. [Article]. *Government Information Quarterly*, 27(2), 141-146.
- Latif, M. H. A., & Masrek, M. N. (2010). Accessibility Evaluation on Malaysian E-Government Websites. *Journal of e-Government Studies and Best Practices*, 2010.
- Maxwell, T. (1997). Teleport Pro. Retrieved October, 2011, from <http://www.tenmax.com/teleport/pro/home.htm>
- Nielsen, J. (2001). Nielsen Usability Metrics. from <http://www.useit.com/alertbox/20010121.html>
- Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005). E-S-QUAL - A multiple-item scale for assessing electronic service quality. *Journal of Service Research*, 7(3), 213-233.
- Pina, V., Torres, L., & Royo, S. (2009). E-government evolution in EU local governments: a comparative perspective. [Article]. *Online Information Review*, 33(6), 1137-1168.
- Turkish Republic Court of Auditors. (2006). *E-devlete geçişte kamu kurumları internet siteleri Performans denetim raporu*. T.C. Sayıştay Başkanlığı.
- Scala, G. (2009-2012). CheckMyColours. 2012, from <http://www.checkmycolours.com/>
- Shi, Y. Q. (2007). The accessibility of Chinese local government Web sites: An exploratory study. [Article]. *Government Information Quarterly*, 24(2), 377-403.

- Sourceforge. (2006). HTML Parser (Version 2.0).
- Sourceforge. (2011). Jericho HTML Parser (Version 3.2).
- TURKSAT. (2009). Kamu Kurumları İnternet Siteleri Standartları ve Önerileri Rehberi (1.1 ed.).
- TÜBİTAK-MAM. (2006). Kamu Kurumları İnternet Sitesi Klavuzu.
- University, T. (2007). A-Prompt Project. 2012, from <http://aprompt.snow.utoronto.ca/index.html>
- Validator, T. (2008). Total Validator Pro (Version 7.1.0).
- W3C. (1999a). Tables in HTML Documents. Retrieved 17 May, 2012, from <http://www.w3.org/TR/1999/REC-html401-19991224/struct/tables.html#h-11.2.4>
- W3C. (1999b). Web Content Accessibility Guidelines 1.0 (WCAG). from <http://www.w3.org/TR/WCAG10/>
- W3C. (2000). XHTML 1.0 The Extensible HyperText Markup Language.
- W3C. (2004-2010). W3C Markup Validation Service. Retrieved June 13, 2011, from <http://validator.w3.org>
- W3C. (2008). Web Content Accessibility Guidelines 2.0. from <http://www.w3.org/TR/2008/REC-WCAG20-20081211/>
- W3C. (2011). Cascading Style Sheets Level 2 Revision 1 (CSS 2.1) Specification.
- Wang, L., Bretschneider, S., & Gant, J. (2005). *Evaluating Web-based e-government services with a citizen-centric approach*. Paper presented at the 38th Hawaii International Conference on System Sciences.
- WebAIM. (2001). WAVE - Web Accessibility Evaluation Tool. 2012, from <http://wave.webaim.org/>

Wood, F. B., Siegel, E. R., LaCroix, E.-M., Lyon, B. J., Benson, D. A., Cid, V., et al. (2003). A practical approach to e-government web evaluation. *IT Professional*, 5(3), 6.

Youngblood, N. E., Mackiewicz, J., & Ieee. (2011). A Usability Analysis of Municipal Government Websites in Alabama. [Proceedings Paper]. *2011 Ieee International Professional Communication Conference (Ipc)*, 4.

APPENDICES

APPENDIX A. TURKISH REPUBLIC COURT OF AUDITORS AUDIT CRITERIA

TASARIM	
	Ana sayfa sade, açık ve anlaşılır olmalıdır.
	Gerektiğinde amaçlananları açıkça temsil eden ve kullanımı kolaylaştıran simgeler kullanılmalıdır.
	Kullanıcıların müdahale edemediği hareketli yazılar kullanılmamalıdır.
	Sayfada gereksiz resim, görüntü ve linklere yer verilmemelidir.
	Yerleşim düzeni (menü, başlık, logo, vs.) bütün sayfalarda aynı olmalıdır.
	Her pencerenin başlığı olmalıdır.
	Varsa bilgi formlarına veri girişinin herkes tarafından kolaylıkla yapılabilmesi için yeterli açıklamalar olmalıdır.
	Yazılar okunabilir bir yazı karakteri ve punto büyüklüğü ile yazılmış olmalıdır.
	Yazıların arka planında metni okumaya engel olan renk ve desenler kullanılmamalıdır.
	Web sayfası ismi açık , kolay ve akılda kalıcı olmalıdır.
	İfadeler özlü olmalıdır
DOLAŞIM	
	Ana sayfada site haritası olmalıdır.
	Her sayfada bir ana sayfa bağlantısı bulunmalıdır.
	Dolaşımı kolay kılan bir menü / alt menü yapısı olmalıdır
	Kullanıcı yön oklarıyla sayfadaki yönünü kolay bulabilmelidir.
	Arızalı ya da kullanıma kapalı sayfa ve linkler bulunmamalıdır.
	Link sayı ve çeşitleri verilen hizmetle uyumlu ve yeterli olmalıdır.
	Bağlantıların konuyla ilgili ve erişilebilir olması sağlanmalıdır.
İÇERİK	
	Web sayfası ile ilgili problemlerin çözümü için başvuru telefonu veya bilgi işlem biriminin telefonu yer almalıdır.
	Web sayfasının kullanımı ile ilgili olarak e-mail iletişimi sağlanmalıdır.
	Bütün birimlerin e-mail, telefon ve adres bilgileri ayrıntılı olarak yer almalı ve kolaylıkla bulunabilmesi sağlanmalıdır.

Site kurumsal bilgileri de içermelidir.
Kurum logosu bulunmalıdır.
Web sayfası en az bir uluslararası dil ile kullanılabilir.
Yazdırılabilir sayfa dönüşümü olmalıdır.
Gerekli dökümanlar, birden çok program türünde ve ücretsiz olarak sunulabilir.
Bütün kullanıcılar için üye kaydı mümkün olmalıdır.
Üye kaydı basit olmalıdır.
Web sayfasındaki güncelleme ve değişiklikler talep eden üyelerin mail adreslerine gönderilebilir.
Web sitesinde site içi arama motoru olmalıdır.
Site içi arama motorunda gelişmiş arama seçeneği de bulunmalıdır.
Sayfanın güncellenme tarihi belirtilmelidir.
ERİŞİLEBİLİRLİK
Web Sayfası görme engelliler açısından kullanılabilir bir şekilde hazırlanmalıdır.
Sesli olarak verilen hizmetler varsa, duyma engelliler açısından bunlar ayrıca alt yazı, resim, animasyon ile de desteklenmelidir.
Web sayfası farklı internet tarayıcı programlarıyla düzgün olarak çalıştırılabilir.

APPENDIX B. EVALUATION CRITERIA OF COURT OF AUDITORS

	Var		Yok	
	N	%	N	%
Çevrimiçi Bilgi				
1- Logo ve açık ad	21	87,5	3	12,5
2- Başlık	20	83,3	4	16,7
3- Telefon-iletişim	14	58,3	10	42,7
4- Adres bilgisi	16	66,7	8	33,3
5- Bağlantılar	21	87,5	3	12,5
6- Sitenin amacı	0	0,0	24	100,0
7- Yayınlar	22	91,7	2	8,3
8- Veri tabanları	20	83,3	4	16,7
9- Yardım	2	8,3	22	91,7
10- Sık sorulan sorular	9	37,5	15	62,5
11- Ses dosyaları	1	4,2	23	95,8
12- Video dosyaları	4	16,7	20	83,3
Elektronik Hizmetler				
13- Kuruma gitmeden alınabilecek hizmetler	10	41,7	14	58,3
14- Çevrimiçi yardım (sohbet odası, interaktif)	1	4,2	23	95,8
Gizlilik ve Güvenlik				
15- Ziyaretçi bilgilerinin kullanılmayacağına dair bilgi	0	0,0	24	100,0
16- Gizlilik ve güvenlik sözleşmesi	0	0,0	24	100,0
Engelli Erişimi				
17- Engelli erişim seçenekleri	2	8,3	22	91,7
Yabancı Dil Erişimi				
18- Farklı dillerde erişim	10	41,7	14	58,3
Kamu erişimi				
19- Personel e-posta	5	20,8	19	79,2
20- Arama	17	70,8	7	29,2
21- Mesaj tahtası	0	0,0	24	100,0
22- Güncelleme bilgisi	6	25,0	18	75,0
23- e-bülten ve hatırlatma mesajı	6	25,0	18	75,0
Üst veri				
24- Sorumluluk-yazar	5	20,8	19	79,2
25- Tanımlama	3	12,5	20	83,3
26- Anahtar kelimeler	3	12,5	20	83,3

APPENDIX C. SELECTED WEB SITE LIST

Institution	URL (in alphabetical order)
Republic of Turkey Ministry of Justice	www.adalet.gov.tr
Republic of Turkey Prime Ministry Disaster and Emergency Management Presidency	www.afetacil.gov.tr
Republic of Turkey Ministry of Family and Social Politics	www.aile.gov.tr
Republic of Turkey Prime Ministry ATATÜRK Supreme Council for Culture, Language and History ATATÜRK Culture Center	www.akmb.gov.tr
Constitutional Court of the Republic of Turkey	www.anayasa.gov.tr
Atatürk Forest Farm	www.aoc.gov.tr
Republic of Turkey Ministry of Defense Department of Recruitment	www.asal.msb.gov.tr
Presidency of Atatürk Research Center	www.atam.gov.tr
Republic of Turkey Ministry of Justice Institute of Forensic Medicine	www.atk.gov.tr
Republic of Turkey Prime Ministry Atatürk Culture, Language and History Institution	www.ayk.gov.tr
Republic of Turkey Prime Ministry	www.basbakanlik.gov.tr
Republic of Turkey Ministry of Environment and Urban Planning	www.bayindirlik.gov.tr
Petroleum Pipeline Cooperation	www.botas.gov.tr
Turkey Directorate General of Tea Businesses	www.caykur.gov.tr
Republic of Turkey Ministry of Forestry and Water Affairs General Directorate of Combating Desertification and Erosion	www.cem.gov.tr
Republic of Turkey Ministry of Transport, Marine and Communication	www.denizcilik.gov.tr
Republic of Turkey Prime Ministry State Archives General Directorate	www.devletarsivleri.gov.tr
Republic of Turkey Ministry of Culture General Directorate of State Opera and Ballet	www.devoperabale.gov.tr
General Directorate of Government Theaters	www.devtiyatro.gov.tr
General Directorate of State Airports Authority	www.dhmi.gov.tr
State Materials Office	www.dmo.gov.tr

Turkey Prime Ministry State Personnel Presidency	www.dpb.gov.tr
General Directorate of State Water Affairs	www.dsi.gov.tr
General Directorate of Meat and Fish Institution	www.ebk.gov.tr
Republic of Turkey Ministry of Energy and Natural Resources	www.enerji.gov.tr
Revenue Administration	www.gib.gov.tr
İstanbul Metropolitan Municipality	www.ibb.gov.tr
Republic of Turkey Ministry of Internal Affairs	www.icisleri.gov.tr
Republic of Turkey Prime Ministry Administration Development Department	www.igb.gov.tr
Public Auction Agency	www.ihale.gov.tr
Turkey Business Establishment	www.iskur.gov.tr
General Command of Gendarmerie	www.jandarma.gov.tr
Republic of Turkey Ministry of Health Department of Encounter with Cancer	www.kanser.gov.tr
Republic of Turkey Ministry of Culture and Tourism	www.kultur.gov.tr
Republic of Turkey Ministry of Youth and Sports General Directorate of Credit and Dormitories	www.kyk.gov.tr
Republic of Turkey Ministry of Finance	www.maliye.gov.tr
Republic of Turkey Ministry of National Education	www.meb.gov.tr
Professional Competence Institution	www.myk.gov.tr
Republic of Turkey	www.osym.gov.tr
Republic of Turkey Ministry of Health	www.saglik.gov.tr
Republic of Turkey Social Security Institution	www.sgk.gov.tr
Turkey Grand National Assembly	www.tbmm.gov.tr
Turkish Language Institution	www.tdk.gov.tr
Republic of Turkey Prime Ministry Housing Development Administration of Turkey	www.toki.gov.tr
Turkish Consumer Information System	www.tuketici.gov.tr
Turkey E-Government Gateway	www.turkiye.gov.tr
Republic of Turkey Ministry for EU Affairs-Center for European Union Education and Youth Programmes	www.ua.gov.tr
Republic of Turkey Prime Ministry Directorate	www.vgm.gov.tr

General of Foundations	
Republic of Turkey Supreme Court	www.yargitay.gov.tr
Republic of Turkey High Election Committee	www.ysk.gov.tr

APPENDIX D. TOTAL VALIDATOR WEB PAGE RESULT EXAMPLE

**Total Validator**
HTML / XHTML / WCAG / Section 508 / CSS / Links / Spelling
[Help](#) | [Website](#) | [Feedback](#)
[Summary](#) | [Page Layout](#) | [More Information](#)

Summary

Page checked: <http://www.botas.gov.tr/webParts/wpOzet/default.asp?lang=tur>
Total errors found: 18 (HTML: 13, WCAG v2 A: 3, WCAG v2 AA: 2)

[Back to website summary](#)

[More information](#)

[Go to first problem](#)

Page Layout

The line numbers refer to lines in the original source.
Any with a line number of '0' are implicit tags added by Total Validator:

```
2 [E869] [WCAG v2 2.4.2 (A)] Add a <title> tag to the page to describe it:

2 [E645] The keyword 'PUBLIC' must be in uppercase for XHTML documents:
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
4 [E621] The 'xmlns' attribute for this tag is missing:
<html>
<head>
5
6 [E647] The character set is not recognised:
<meta http-equiv="content-type" content="text/html; charset-windows-1254" />
7 [E647] The character set is not recognised:
<meta http-equiv="content-type" content="text/html; charset-iso-8859-9" />
8 <meta http-equiv="cache-control" content="public" />
9 <meta http-equiv="pragma" content="public" />
10 [E610] One or more of the following tags are missing from within the enclosing tag: <title>
</head>
11 [E650] The default style sheet language must be specified when style attributes are used:
<body style="background-color:transparent;text-decoration:none;">
12 [E650] The default style sheet language must be specified when style attributes are used:
<div style="position:absolute;top:0px;left:0px;z-index:10;">
13 <table>
14 <tr>
15 <td>
16 <table border="0" cellpadding="0" cellspacing="0">
17 <tr>
18 <td>
19 [E627] All attribute names must be in lower case:
E620 The 'marginleft' attribute is not valid for this tag here:
E650 The default style sheet language must be specified when style attributes are used:
E878 [WCAG v2 4.1.2 (A)] Add a 'title' attribute to facilitate identification and navigation:
E910 [WCAG v2 1.4.4 (AA)] Use relative, rather than absolute units:
<iframe id="mm0" height="250" width="490" src="m0.asp?lang=1" MarginHeight="0"
MarginLeft="0" frameborder="0" scrolling="no" style="background:url(/images/webpart/wpOzet_hrtBg.png) "
allowtransparency="true">
19 </iframe>
20 </td>
21 </tr>
```

```

22         </table>
23     </td>
24 </tr>
25 <table border="0" cellpadding="0" cellspacing="0">
26 <tr>
27 <td>
28 E627 All attribute names must be in lower case.
E620 The 'marginleft' attribute is not valid for this tag here.
E650 The default style sheet language must be specified when style attributes are used.
E878 [WCAG v2 4.1.2 (A)] Add a 'title' attribute to facilitate identification and navigation.
E910 [WCAG v2 1.4.4 (AA)] Use relative, rather than absolute units.
        <iframe id="mm3" height="250" width="393" src="m3.asp?lang=1" MarginHeight="0"
        MarginLeft="0" frameborder="0" scrolling="no" style="background:url(/images/webpart/wpOzet_dyrBg.png) "
        allowtransparency="true">
29     </iframe>
30 </td>
31 </tr>
32 </table>
33 </td>
34 </tr>
35 </table>
36 </div>
37 </body>
</html>

```

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More Information

HTML Errors

E610 - 1 instance(s): The HTML specification being tested against defines that the tag identified must have one or more specific tags nested within it. You should add one or more of the missing tag(s) as appropriate.

E620 - 2 instance(s): The most common reason for this error is the use of a browser-specific attribute (such as 'leftmargin' in the <body> tag), which is not part of the official HTML specification being tested against. If the attribute is for purely for layout then consider using CSS instead.

E621 - 1 instance(s): The HTML specification being validated against requires that the attribute indicated should be used.

E627 - 2 instance(s): XML is case-sensitive and in XHTML all attribute names are defined as being in lower case. See <http://www.w3.org/TR/xhtml1/#h-4.2> (displayed in new window).

E645 - 1 instance(s): The keyword 'PUBLIC' must be all in uppercase for XHTML documents. You can find a list of the <!DOCTYPE> tags that Total Validator recognises [here](#) (displayed in new window).

E647 - 2 instance(s): The character set specified is not recognised. This may be because it is misspelled.

E650 - 4 instance(s): When style attributes are used the default style sheet language should be specified using a Content-Style-Type HTTP header or <meta> tag. See <http://www.w3.org/TR/html401/present/styles.html#h-14.2.1> (displayed in new window).

WCAG v2 A Errors

E869 - 1 instance(s): You should always provide a <title> element in the head section that defines in a simple phrase the purpose of the document. See <http://www.w3.org/TR/WCAG20-TECHS/F25.html> (displayed in new window)

E878 - 2 instance(s): Title each <frame> and <iframe> to facilitate identification and navigation. See <http://www.w3.org/TR/WCAG20-TECHS/H64.html> (displayed in new window)

WCAG v2 AA Errors

E910 - 2 instance(s): Using relative units helps the page to be rendered correctly at different resolutions and allows people with sight difficulties to 'zoom in' to pages to read them. See <http://www.w3.org/TR/UNDERSTANDING-WCAG20/visual-audio-contrast-scale.html> (displayed in new window)

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APPENDIX E. TOTAL VALIDATOR WEB SITE SUMMARY RESULT EXAMPLE



Total Validator
HTML / XHTML / WCAG / Section 508 / CSS / Links / Spelling
[Help](#) | [Website](#) | [Feedback](#)

Summary

Starting page: <http://www.botas.gov.tr/>
Started at: 20:30:11 GMT, March 07, 2012
Time taken: 5 seconds
Validator Version: v7.1.0
Total pages checked: 15
Total links checked: 58
Total pages with problems: 12
Total errors found: 302

Options:

- Validation level: Only report errors
- Accessibility: AAA2
- CSS: 2.1
- Check for broken links: true

- Time out: 15 seconds
- Concurrency: unlimited
- (X)HTML validation: XHTML 1.0 Transitional

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Validation results

Click on any image(s)/link(s) below to view the results.
For pages that validate you can [display a logo](#).

<http://www.botas.gov.tr/>

32 error(s): HTML: 25, WCAG v2 A: 6, Link Errors: 1

<http://www.botas.gov.tr/webParts/wpOzet/default.asp?lang=tur>

18 error(s): HTML: 13, WCAG v2 A: 3, WCAG v2 AA: 2

<http://www.botas.gov.tr/webParts/wpSosyal/default.asp>

27 error(s): HTML: 23, WCAG v2 A: 4

<http://www.botas.gov.tr/index.asp?id=1>

37 error(s): HTML: 31, WCAG v2 A: 5, Link Errors: 1

<http://www.botas.gov.tr/index.asp?id=2>

37 error(s): HTML: 31, WCAG v2 A: 5, Link Errors: 1

<http://www.botas.gov.tr/index.asp?id=3>

37 error(s): HTML: 31, WCAG v2 A: 5, Link Errors: 1

<http://www.botas.gov.tr/defaultTR.asp>

30 error(s): HTML: 23, WCAG v2 A: 6, Link Errors: 1

<http://www.botas.gov.tr/webParts/wpOzet/m0.asp?lang=1>

19 error(s): HTML: 17, WCAG v2 A: 2

<http://www.botas.gov.tr/webParts/wpOzet/m3.asp?lang=1>

38 error(s): HTML: 34, WCAG v2 A: 4

<http://www.botas.gov.tr/icerikL.asp?id=tMmM01>

9 error(s): HTML: 8, WCAG v2 A: 1

<http://www.botas.gov.tr/icerikL.asp?id=tMmM02>

9 error(s): HTML: 8, WCAG v2 A: 1

<http://www.botas.gov.tr/icerikL.asp?id=tMmM03>

9 error(s): HTML: 8, WCAG v2 A: 1

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APPENDIX F. CHECK MY COLOURS RESULT FILE EXAMPLE



<http://www.botas.gov.tr>

Testing done on 29 elements

- Luminosity Contrast Ratio: *18 failures*
- Brightness difference: *18 failures*
- Color difference: *18 failures*

only errors

Click on the rows to test other colours

Node	Foreground	Background	Sample	Contrast Ratio	Brightness difference	Color difference
BODY	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
CENTER	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
DIV id='govde'	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
DIV id='headerPart'	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
DIV id='headerAmblem'	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
IMG	#FFFFFF	#E0E0E0	Sample Text	1.32:1	31	93
DIV id='headerAlev'	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
DIV id='headerBayrak'	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672
TR	#000000	#4E5154	Sample Text	2.63:1	80	243
TD	#000000	#4E5154	Sample Text	2.63:1	80	243
DIV id='footerPart'	#000000	#B6C1D6	Sample Text	11.59:1 AAA	192	589
IMG	#FFFFFF	#B6C1D6	Sample Text	1.81:1	62	176
SPAN id='footS6' class='copyright'	#FFFFFF	#B6C1D6	Sample Text	1.81:1	62	176
SPAN class='bottomlinks'	#FFFFFF	#B6C1D6	Sample Text	1.81:1	62	176
A id='footS1'	#FFFFFF	#B6C1D6	Sample Text	1.81:1	62	176
A id='footS2'	#FFFFFF	#B6C1D6	Sample Text	1.81:1	62	176
A id='footS5'	#FFFFFF	#B6C1D6	Sample Text	1.81:1	62	176
DIV	#000000	#E0E0E0	Sample Text	15.91:1 AAA	224	672

TEZ FOTOKOPI İZİN FORMU

ENSTITÜ

Fen Bilimleri Enstitüsü

Sosyal Bilimler Enstitüsü

Uygulamalı Matematik Enstitüsü

Enformatik Enstitüsü

Deniz Bilimleri Enstitüsü

YAZARIN

Soyadı : Yalçinkaya

Adı : Sinem

Bölümü : Bilişim Sistemleri (Information Systems)

TEZİN ADI (İngilizce) : Assessing Standard Compliance of Public Institution
Web Sites of Turkey

TEZİN TÜRÜ : Yüksek Lisans

Doktora

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın.
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullanıcılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.)
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.)

Yazarın imzası

Tarih