USER-CENTERED DESIGN APPROACH IN E-GOVERNMENT APPLICATIONS

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

BY

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

FEBRUARY 2012

USER-CENTERED DESIGN APPROACH IN

E-GOVERNMENT APPLICATIONS

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ABSTRACT

USER-CENTERED DESIGN APPROACH IN E-GOVERNMENT APPLICATIONS

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February 2012, 174 pages

Public services have been provided in an electronic format to reduce time and cost and to improve service quality. In this context, significant investments have been made since 2003 in Turkey and many government agencies started to provide services via the Internet. Government agencies need to learn the effectiveness of the offered services and the benefits of these services to citizens. The purposes of this thesis are to evaluate e-government websites in a comprehensive manner and to identify website design related problems. Especially, the study focuses on user-centered design of the e-government application. For this purpose, 33 e-government websites are evaluated, and an interview was conducted with eight government agencies websites' designers. As a result of these studies, the problems encountered while using government electronic services are identified. Also, causes of these problems are found out. The study aims to provide a guideline in order to design user-centered e-government applications.

Keywords: E-government, user-centered approach, usability, accessibility, website evaluation.

ÖZ

E-DEVLET UYGULAMALARINDA KULLANICI ODAKLI TASARIM YAKLASIMI

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Tez Yöneticisi: Prof. Dr. Kürşat ÇAĞILTAY

Şubat 2012, 174 sayfa

Kamu hizmetlerinin elektronik formatta sunulmasıyla, zaman ve maliyetin azalması, hizmet kalitesinin geliştirilmesi amaçlanmaktadır. Bu kapsamda Türkiye'de 2003 yılından itibaren önemli yatırımlar yapılmış ve bir çok devlet kurumu hizmetlerini Internet üzerinden sunmaya başlamıştır. Devlet kurumları, sundukları hizmetin etkinliğini ve vatandaşa sağladığı faydayı öğrenmeye ihtiyaç duymaktadır. Bu tezin amacı e-devlet web sitelerini geniş bir kapsamda değerlendirmek ve web siteleri tasarımı ile ilgili problemleri belirlemektir. Çalışma özellikle e-devlet web sitelerinin kullanıcı odaklı tasarlanması üzerine yoğunlaşmaktadır. Bu amaç doğrultusunda, Türkiye'deki 33 e-devlet web sitesi değerlendirilmiş, sekiz devlet kurumunun web sitesi tasarımından sorumlu kişilerle bir görüşme gerçekleştirilmiştir. Bu çalışmaların sonucunda, değerlendirilen devlet kurumlarının elektronik hizmetleri kullanılırken karşılaşılan problemler ve bu problemlerin sebepleri belirlenmiştir. Çalışma, e-devlet uygulamalarının kullanıcı odaklı tasarlanabilmesi için bir rehber sunmayı hedeflemektedir.

Anahtar Kelimeler: E-devlet, kullanıcı odaklı tasarım, kullanılabilirlik, erişilebilirlik web sitesi değerlendirme.

To My Family

ACKNOWLEDGEMENTS

I would like to express my deepest and sincerest gratitude to my supervisor Prof. Dr. Kürşat ÇAĞILTAY for his continuous guidance, advice and support throughout the preparation of the thesis.

I would like to express my thanks to Prof. Dr. Yasemin YARDIMCI ÇETİN, Assoc. Prof. Dr. Altan KOÇYİĞİT, Assoc. Prof. Dr. Tolga CAN, Assist. Prof. Dr. Murat Perit ÇAKIR and Dr. Ali ARİFOĞLU for their valuable comments and advices that really assist in forming the thesis.

I would like to thank Tunç Durmuş MEDENİ, Elif SÜNGÜ AKTEKİN, Aşkın KELEŞ for their contribution to my thesis.

I would like to express my sincere thanks to my friends Yıldız Ceren ORDU, Yusuf YILMAZ, Özge KARA, Menekşe DÜZCE, Gülgün AFACAN, Eren ESGİN, Yasemin ÇETİN, Umut TÜRKARSLAN, Hakan SARGIN,.and Murat KARAÖZ.

I appreciate Ali KANTAR, Necla IŞIKLAR, Hakan GÜLER, Ayşe CEYLAN, Sibel GÜNAR, and Sibel SEL in the institute for their kindness since the beginning of my M.Sc. study.

Finally, I would like to express my profound thanks to my family; my father Hayri DURMUŞ, my mother Filiz DURMUŞ, my brothers Serdar DURMUŞ and Osman DURMUŞ and my little princess Ecem Buse DURMUŞ. It is a inexpressible pleasure to thank them who made this thesis possible for me with their patience and encouragement. They always believed in me and strengthen me in my hard times with their great love, compassion and leading advices.

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CHAPTER – 1

INTRODUCTION

Innovations of technology make significant effects on the global world. Technological developments influence economy, social life, business and how public services are delivered. These innovations also cause a social transformation. Governments are enforced to adopt such changes and to be a member of "Information Society".

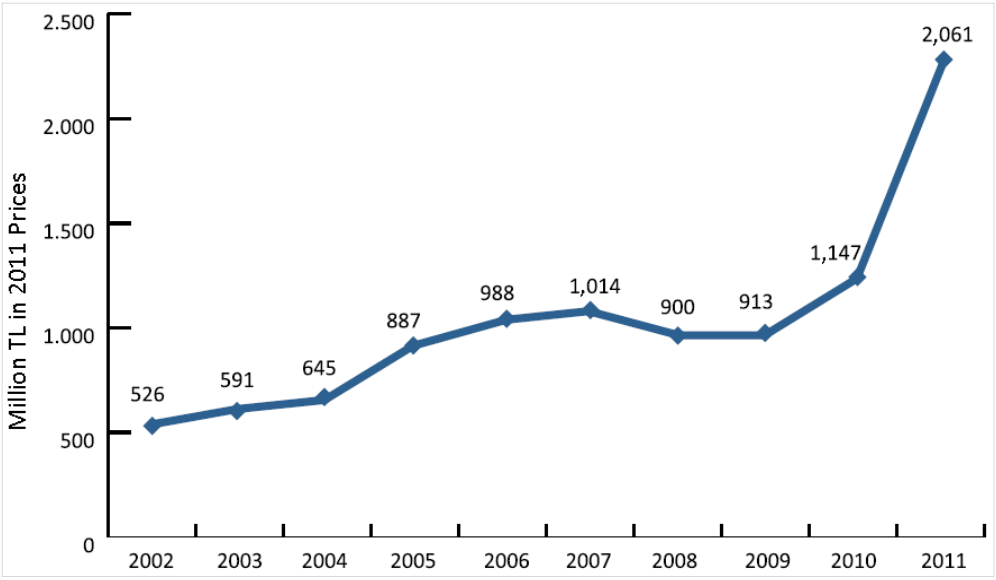
In the Information Society, citizens use the opportunities provided by the Information and Communication Technologies (ICT). Governments aim to provide efficient services with the usage of technology. Also, they produce, use and access information with qualified manpower.

In order to be a member of "Information Society", countries take action plans and develop strategies for e-transformation. In 2000, European Union developed Lisbon Strategy to be a competitive and dynamic knowledge-based economy in the world (SPO, 2006). The Lisbon Strategy was updated in 2005; information, innovation and social inclusion became core topics. They determined 20 basic public services that must be served via Internet.

In parallel to these developments, Turkey started to work on information technology and to understand its effects. In 2003, the Turkish Government developed an urgent action plan which is about "E-Transformations of Turkey Project". E-Government issue was the critical part of the E-Transformation Turkey Project. It was targeted to

develop citizen-focused services delivery and to provide high standards of public services.

Significant progress has been made to achieve this goal since 2000. Government agencies have started to construct technological infrastructure. They made a significant investment on the ICT. Figure 1-1 shows that 9,6 billion TL have been reserved for ICT investments for the period 2002-2011. The amount of funds allocated for public ICT investments in 2011 exceeded 2 billion TL (Information Society Statistics of Turkey, 2011). These investments mainly cover the procurement of software and hardware and maintenance of existing information systems.



Source: State Planning Organization, 2011

Figure 1- 1 ICT Investment of Turkey from 2002 to 2011

Moreover, 70 % of government services are provided via electronic channels in 2011 (National Statistic Institute, 2011). Turkey also provides 20 basic services such as job search service, social security service, declaration to the police, corporate tax, health related services and submission of data to statistical offices determined from European Union Lisbon Strategy, electronically. There are 23.835 e-government websites in 2011 (National Statistic Institute, 2011).

Significant projects have been implemented since 2000. Governments need to understand results of their actions. They aim to evaluate their performance and to measure effectiveness and efficiency of these studies. Especially, citizens' satisfaction level of electronic services must be found out in order to use investments properly and increase service quality concerning the users' needs.

In order to answer these questions, some studies have been conducted about ICT usage, Technology Acceptance Model (TAM), accessibility, usability and usage rate of e-government services. National Statistic Institute has made studies to find out ICT access in households and enterprises rates. According to these studies, user involvement rates of ICT usage have been increasing (National Statistic Institute, 2011).

Moreover, many studies have been made on the technology acceptance rate of Turkish citizens. One of the studies was conducted in 2011 that aimed to analyze technology acceptance in Turkey. According to this study results, perceived ease of use was more effective in people’s acceptance of technology than the perceived usefulness. (Şenel & Şenel, 2011). Another study is about assessment of e-school application by school managers using extended TAM. The study results show that technology acceptance is changed according to gender and age. For example, male school principals and younger school principals had more positive perceptions to the usefulness of e-school application. (Bağlibel, Samancıoğlu & Summak, 2010).

Furthermore, usability issue of the e-government websites has been examined by researchers. The focus "Use the E-Transformation" study was human computer interaction and usability of e-government services. Usability problems of e-government services were stated in this study. Also, it was recommended that in order to maximize usability of public websites, usability studies should take into account as an expenditure item (Çağıltay, 2005).

In addition, accessibility of e-government websites has been studied. Kubuş and Çağıltay (2006) examined the accessibility issues of e-government websites

regarding visually impaired people. In this study, the visually impaired users tried to complete the tasks given about four selected e-government websites. Six main accessibility problems were found; these problems were related with navigation, long texts, improper music usage, text box usage and sufficient explanation of pictures and graphs.

Beside these works, Türksat, a government agency that is responsible for the e-government gateway projects, has accomplished a study to find out information regarding the access rate and use of public services in the electronic environment by citizens and enterprises services (SPO, Turkish Information Society Statistics of Turkey, 2011). The study was conducted in 2009. According to this study, 72,8 % of enterprises use e-government applications, but only 22,2 % of households make use of these services. Türksat also made research regarding to examine why people do not use e-government websites. The study was conducted for enterprises and households separately. The study covered the 2007 to 2010 years. According to these studies, households and enterprises people declared the following reasons for not using e-government services (SPO, Turkish Information Society Statistics of Turkey, 2011):

- Difficult to navigate,
- Not user friendly,
- Concerns regarding the security and protection of information,
- Delay of feedback in emergency situations,
- Preference to meet face to face,
- Contacting public agencies over the Internet being very complicated, and
- Unavailability of services over the Internet.

In order to decrease these problems, Türksat conducted a study and developed a guideline for effective e-government developments. This study emphasized that e-government websites' design must be done according to the citizens' characteristics and needs. The institute developed an evaluation tool and provided it to the government agencies to conduct self evaluation.

1.1 Purpose of the Study

The previous studies were generally focused on usage rate of ICT and e-government, technology acceptance of Turkish people and usability of e- government websites. There is little effort to concentrate on a comprehensive evaluation of e-government efforts with regards as user centered perspective.

This thesis lights a point about a user-centered design of the e-government websites. The purposes of this study are that:

- Improving Türksat e-government evaluation tool in terms of user-centered approach,
- Conducting comprehensive e-government websites evaluation by using improved Türksat tool,
- Investigating e-government website designers' attitudes towards user centered approach, and
- Providing guidelines for user-centered website development.

This research also investigates the development process of e-government websites in terms of website designers' view. It will mention the designers' efforts on the user-centered website development.

Beside these, this thesis will provide recommendations for user-centered website development.

1.2 Research Questions

Given the above information, research questions of this study are detailed as follows:

- What are the performances of 33 evaluated e-government websites in Turkey in terms of user-centered approach?

- What are the e-government websites designers' attitudes to involve users all stages of the website development?

- What efforts should be done to prepare an effective user focused websites?

1.3 Significance of the Study

This study will be a significant endeavor in e-government websites evaluation. In total, 33 public agencies' websites were evaluated such as e-Government Gateway, Social Security Institute, Ministry of Justice, Ministry of National Education, Turkish National Police and Revenue Administration. The websites' evaluations were conducted in 18 different areas (accessibility, usage improvement, navigation, security, homepage and etc) with 107 questions. It was a comprehensive study, almost all websites' features were considered in the evaluation tool. Therefore, 33 evaluated government agencies will have an opinion about strengths and weaknesses of their websites.

1.4 Thesis Organization

The rest of the study is organized as follows; In Chapter 2, the literature review of the study is given. In Chapter 3, the methodology of the study is provided in detail. In Chapter 4, evaluation of e-government websites and survey results are presented. Finally, Chapter 5 presents the discussion and conclusions. In this chapter, guideline is given to develop e-government websites in a user-centered approach.

TERMS

E-government: Electronic government is web-based Internet applications, to enhance the access and delivery of government information and service to citizens.

Usability: It is a qualitative measure of the relative ease in which a user interacts with an e-government website to accomplish his/her goals

Accessibility: Individuals with disabilities can perceive, understand, navigate, and interact with the web.

User-centered design: It is a philosophy and an approach that places users at the center of the design process from the stages of planning and designing the system requirements to implementing and testing the product.

Functionality testing: Functionality testing is used to assess how well a website is performing the desired tasks. Functionality testing assesses whether the system works as it is designed and provides the results as it is intended to deliver.

CHAPTER – 2

LITERATURE REVIEW

This chapter introduces basic concepts related to e-government, usability and accessibility. It also focuses on citizen centric approach of e-government service development. Finally, it provides the related studies in the World and Turkey in this area.

2.1 E-Government

The Internet's popularity and acceptance have created a new medium for service delivery. Governments aim to improve the interaction between government and citizens with the help of public services through an intensive use of information technology (Gil-Garcia & Pardo, 2005). They transform services into electronic platform (internet) and make them a part of e-Government. Tapscot perceives e-government as an internet worked government (Tapscot, 1996). McClure defines electronic government as web-based Internet applications, to enhance access and delivery of government information and service to citizens, business partners, employees, other agencies and government entities (as cited in Wang, Bretschneider & Gant, 2005).

E-government is fundamentally defined as the use of information technologies to provide government information and services through the World Wide Web. E-

government activities are designed to benefit government agencies, businesses, and citizens (Jaeger, 2006).

In point of fact, all these definitions emphasize the benefits of delivering public services to citizens via the Internet. According to Bekkers and Zouridis, the main benefits of e-government are providing citizens with quicker and better access to public information and the ability to use services in a more personal and cost-effective manner (as cited in Verdegem & Verleye, 2009). Governments are able to expand service capability to 24x7 (twenty-four hours a day / seven days a week) at anytime, anywhere (Turkey Informatics Council, 2002) which makes e-government a time and cost saving activity.

Moreover, e-government pushes the reform agenda (the modernization of the administrations) to make the government and its policies more efficient. Government efforts to maximize the use of networked digital information include innovations designed to automate common processes among other goals (Andersen & Henriksen 2004, p. 5). The increase in efficiency would strengthen the quality of services, and the ambition to achieve more effective outcomes in key policy areas (as cited in Verdegem & Verleye, 2009). As a result, new services are offered with more functional capabilities.

Another benefit of e-government is reducing the distance between citizens and the government which strengthens democracy. In addition, public service deliveries via ICT also lead to an improved relationship between government and citizens or businesses (Millard, 2003). Moreover, e-government services make government more transparent with the help of laws (such as Information Acquisition Law). Public records can be accessible by the citizens to monitor and to participate in e-government (Baker, 2008). As a result, trust is built between governments and citizens (OECD, 2007).

E-government not only aims to transform the state into an electronic state but also to transform the economy into a knowledge-based economy, the society into an

information society, and the individual into an e-individual. It is in this sense that e-government represents a new way of reasoning concerning the economy, society and the self.

2.2 Website Usability

By providing services via website, usability of a website has become a crucial issue. A number of definitions for usability have been offered in the existing literature. Usability term is related with easiness. It is also defined a qualitative measure of the relative ease in which a user interacts with an e-government website to accomplish his/her goals (Baker, 2008). Pearrow also thinks that usability is related with how easily user can use a website to accomplish specific tasks (2000).

According to ISO 9241, usability is directly related to effectiveness, efficiency and satisfaction of a user. The terms effectiveness, efficiency and satisfaction are defined as below (as cited in Babayiğit, 2003):

- **Effectiveness:** The accuracy and completeness with which specified users can achieve specified goals in particular environments.
- **Efficiency:** The resources expended in relation to the accuracy and completeness of goals achieved.
- **Satisfaction:** The comfort and acceptability of the work system to its users and other people affected by its use.

The attributes of the usability have been studied from different researchers; Babayiğit defines usability attributes in Usability Evaluation Framework study (2003). In addition, Holzinger, Searle, Kleinberger, Seffah, and Javahery work on usability attributes in their Investigating Usability Metrics study (2008). Table 2-1 represents usability attributes with these two different perspectives in the literature.

Table 2- 1 Usability attributes and definitions

Usability Attributes	**Definition**
Understandability	Find and get demanded information easily.
Learnability	Learn the system easily.
Reliability	Error safety
Efficiency	Speed of performance.
Effectiveness	The accuracy and completeness of the desired tasks.
User satisfaction	Users' overall feelings about the system and comfort and acceptability of use
Error recovery & prevention	The utilization and usefulness of the tutorial, help menu and informative messages
Controllability	Users can control the system in terms of navigation and error prevention

Usability needs change for each website. The needs depend on the type of websites, aims of the websites, services of the websites and audience's characteristic of the websites. For example, e-government website design is not same as a business company website design, because, audience, importance of the services and needs are different. In order to achieve desired usability features, the design decision of the website is changed. With the usability evaluation, governments aim to assess system functionality, existing problems and effects of interface for the users.

The design decision needs to be evaluated critically to find and eliminate possible problems. According to Van Dijk, Pieterson and Ebbers (2007), usability problems are among the reasons for the underuse of e-Government websites. Therefore, government organizations need to evaluate the content and usability of their websites. (Bertot & Jaeger, 2008).

There are different usability evaluation methods in the literature such as (Çağıltay, 2011):

- User observation,
- End user interviews,

- Task analysis,
- Benchmarking and competitive analysis,
- Usability testing,
- Standards and guidelines, and
- Expert analysis.

2.3 Accessibility

The term accessibility means "capable of being reached" to the given services. Website accessibility is simply defined as "Access by everyone regardless of disability is an essential aspect" (WAI, 2011). Jaeger (2008) defines web accessibility that individuals with disabilities can perceive, understand, navigate, and interact with the web. Accessibility is not only related with disability, it also includes people who have not enough knowledge and interest about computer usage, but they need to use web services. For example, it is difficult to use online services for older people due to aging.

According to State Planning Agency statistics which was conducted in 2002, 12% of the populations of Turkey have some forms of disability. Approximately 420.000 of them have vision disability; remaining people have different forms of disabilities. The World Wide Web Consortium (W3C) defines users with access difficulties as follows (Anderson, Bohman, Burmeister, Sampson & Wild, 2004).

- "They may not be able to see, hear, move, or may not be able to process some types of information easily.
- They may have difficulty reading or comprehending text.
- They may not have or be able to use a keyboard or mouse.
- They may have a text-only screen, a small screen, or a slow Internet connection.
- They may not speak or understand fluently the language in which the document is written.
- They may be in a situation where their eyes, ears, or hands are busy or interfered with (e.g., driving to work, working in a loud environment).

- They may have an early version of a browser, a different browser entirely, a voice browser, or a different operating system."

All people, with or without disabilities, have a right to access government information on the Internet. This is a requirement of the democracy. With the aim of improving accessibility of websites, W3C has developed a standard for website accessibility that is The Web Content Accessibility Guidelines (WCAG). They determined users' needs and state the criteria. Table 2-2 summarizes the accessibility conditions that a website should provide according to the WCAG 2.0 (WAI, 2011).

Table 2- 2 Accessibility criteria according to WCAG 2.0

Perceivable	• Provide text alternatives for any non-text contents. • Provide alternatives for time-based media. • Create content that can be presented in different ways (for example simpler layout) without losing information or structure. • Make it easier for users to see and hear content with separating foreground from background.
Operable	• Make all functionalities available from a keyboard. • Provide users enough time to read and use content. • Provide ways to help users navigate, find content, and determine where they are.
Understandable	• Make text content readable and understandable. • Make webpage appear and operate in predictable ways. • Help users to avoid and correct mistakes.
Robust	• Maximize compatibility with current and future users, including assistive technologies.

2.4 User-centered Design

E-Government websites design approaches have been increasingly examined and questioned to enhance service quality. It is deduced that current efforts on the e-

government websites design mainly concentrate on websites' features that would enhance the usability, but few of them answer why some web designs are better than others to facilitate citizens' information seeking (Wang, et al., 2005). To make sure the website is usable by all people; users' needs must be specified and involved in all stages of the design process.

According to Baek, Çağıltay, Boling and Frick (2007), user centered designed was defined that:

> *A design philosophy and approach that places users at the center of the design process from the stages of planning and designing the system requirements to implementing and testing the product (p. 3).*

They stated that user centered design was considered as a part of the socio-technical approach. The socio-technical approach is not only technical aspects of a system but it is also related with social aspects which are people, network of roles, relationships and tasks (Baek 2007 et al., p. 6). According to this approach, designers must make an early and continuous contact with users. Designers take into account users' various backgrounds (Baek 2007 et al., p. 6).

User centered-design is a philosophy and a process. It is a philosophy that places the person at the center. It is a process that composes of on cognitive factors such as perception, memory, learning, problem-solving, etc. These factors have roles during peoples' interactions with things in the websites (Katz-Haas, 1998).

Website usability is a structured product development methodology that involves users in all stages of website development to meet users' needs (Krumov, 2007). Beside user needs, this approach takes into account an organization's business objectives, limitations, and preferences. This structural approach includes interviews, observations and studies and testing with actual end users. Iyengar conducted a study in 2007 that defines user centered design process in four phases which are analysis, design, standards and supports (shown in Figure 2-1). In all these phases, end users play an important role. In Analysis phase, usability requirements are determined and

concept testing is conducted with actual users. In the design phase, user involvement is provided and formative testing is conducted with the users to evaluate the design processes. At the end, summative testing is performed to ensure the usability of the website (Iyengar & Gadgil, 2007, p.5).

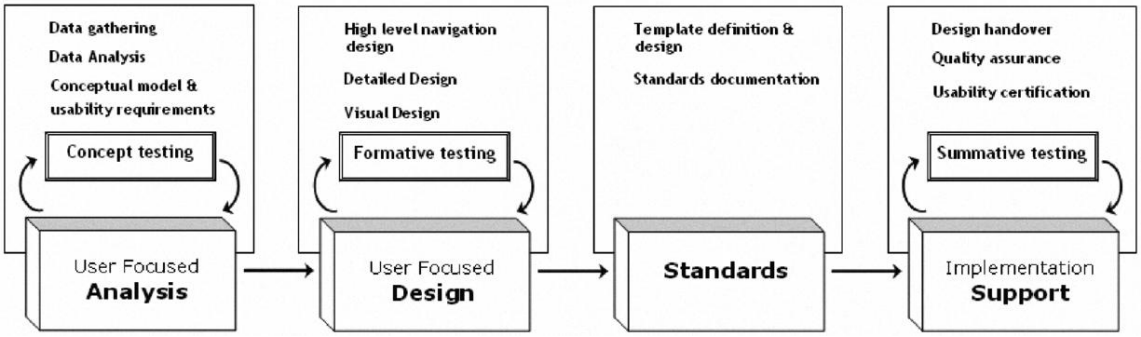


Figure 2- 1 User-centered design process

In addition, Iyengar made some suggestions that need to be taken into consideration while designing user centered e-government websites, some highlights of his study are explained as follows:

- In order to understand users' demands, designers must make a survey over 300 users.
- The designs of the websites must be shaped with stakeholders' needs.
- Formative and summative usability testing must be conducted to improve the design.
- Designers must make researches to evaluate performance of their websites.
- Visual design must reflect the brand of the website.

User-centered design approach has been increasingly examined and used. Therefore, government agencies require to evaluate the effectiveness of user centered design approach. According to Jaeger and Bertot (2006, p.164), there are three key elements of user centered evaluation of the e-government websites. These elements are functionality, usability and accessibility testing which are described in Table2-3.

Table 2- 3 User-centered design key elements

Method	Purposes
Functionality	Functionality testing is used to assess how well a website is performing the desired tasks. Functionality testing assesses whether the system actually works as it is designed and provides the results as it is intended to deliver.
Usability	Usability testing is used to assess the extent to which a website enables users to intuitively access and employ the elements of a site. Usability testing is used to assess the overall quality of user experience such as interacting with the website, ease of use, efficiency, memorability and levels of satisfaction. Usability testing also assesses how users react to and interact with the program and express personal impressions of the resource, such as satisfaction, utility, benefits, frustration, and self-efficacy.
Accessibility	Accessibility testing is used to assess how well systems provide users equal access. It is also focusing on the specific needs of users with disabilities.

Functionality, usability, and accessibility are useful beginning points to evaluate user centered e-government websites. In addition, they can provide important perspectives from the actual users of e-government services. While many researchers believe that this design strategy increases the services quality and satisfaction level of the actual users, little work is found to evaluate e-government services in this sense that showing if this effort is meeting these goals.

This thesis examines the studies about usability, accessibility, user-centered approach and e-government performance evaluations in the World and Turkey to make useful beginning points in user-centered evaluation area.

2.5 E-Government Ranking Studies in the World

This section aims to describe e-government evaluation studies in the world in a systematic way. There are various studies in the world to measure performance of governments' services. This thesis especially focuses on the user-centered design evaluation, performance evaluation, usability and accessibility evaluation studies in the World. It also selects studies in which Turkey exists. These studies are listed as bellow:

1. United Nations e-Government Survey
2. Digitizing Public Services in Europe
3. Waseda University the World e-Government Ranking

2.5.1 United Nations e-Government Survey - 2010

United Nations e-Government Survey has been conducted since 2003. The survey evaluates e-government website in two sides: one is e-government development; the other is e-participation of government websites.

The first side of survey aims to investigate development efforts of the e-Government services from different countries. It intends to find out the level of maturity of e-government services. It is a comprehensive survey that contains 192 member states. The results are giving with a set of indicators such as a country's capacity to participate in the information society and e-government development efforts. The most important dimensions of this study are; scope and quality of online services, telecommunication connectivity, and human capacity.

The questionnaire method is used. The research team followed a citizen-centric approach for the assessment of online services; they are putting them in the place of the average user. They also check the accessibility of websites according to Web Content Accessibility Guidelines of the World Wide Web Consortium

The survey presents the results with an index which ranges between values 0 and 1. Turkey and the world average of e-development index values are shown in Figure 2-2.

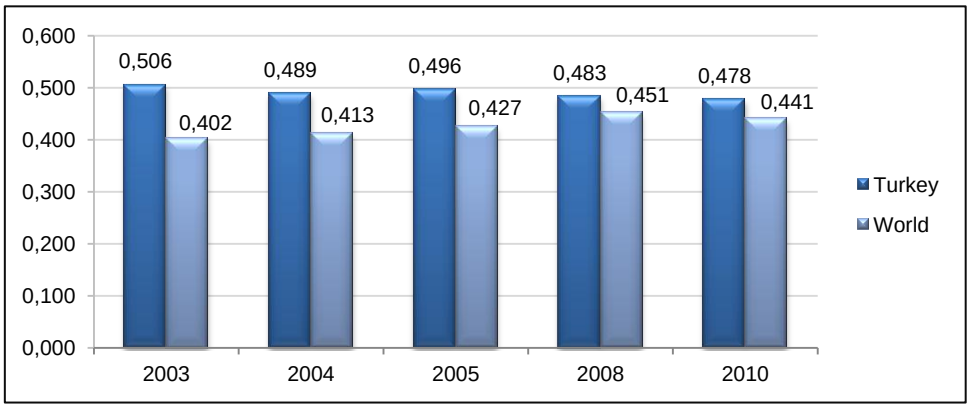


Figure 2- 2 UNs e-Government Development Survey Results

Although Turkey has achieved better than the world average in each of five years, its e-government index has declined between years from 2003 to 2010. According to this study, the ranking of the Turkey changes as shown in Table 2-4.

Table 2- 4 UNs e-Government Survey Ranking

Year	E-government development Ranking	# of Countries
2003	49	191
2004	57	191
2005	60	191
2008	76	192
2010	69	184

In terms of recent scores, Turkey has achieved the best ranking result in 2003 and moved into 69th position in 2010. According to UN survey Turkey decreases its performance. On the other hand, the world has raised e-development index value from 2003 to 2010. This results show that Turkey cannot follow development pace of e-government services of the World according to UN Survey.

The second side of survey aims to measure citizens' engagement of each country, in other words, the survey investigates user centeredness of the e-government agencies. E-government participation index aims to assess the maturity of electronic information dissemination, electronic consultation and electronic participation in

decision-making. Each of these aspect focuses on the relationship between online services and citizen empowerment on citizen-centric governance.

- **Electronic Information Dissemination:** In this section, citizens' engagement of public policy, laws and regulations are evaluated.

- **Electronic Consultation:** This section aims to evaluate the effectiveness of communication between government, citizens and businesses. It focuses on the feedbacks and government agencies response.

- **Electronic Participation in Decision-Making:** This section is related with communication between citizens and government agencies.

Turkey's e-participation index 2010 result is shown in the Table 2-5.

Table 2- 5 Turkey's e-participation index

E-information	E-consultation	E-decision making	Total Score
37.50	18.18	37.50	26.32

The study groups the results in three categories;

- **Total score above 60:** There are four countries; Republic of Korea, Australia, Kazakhstan and Bahrain.

- **Total score between 30 and 60:** There are 17 countries in this group such as; Spain, Japan United States of America, Colombia and Cyprus.

- **Total score below 30:** There are seven countries in this group. Turkey is ranked in this group. E-participation quality is low according to this study. Government agencies must make more studies to provide user involvement into design and development stages of the e-government websites.

2.5.2 Digitizing Public Services in Europe - 2010

It is a comprehensive study that shows the performance measurement of countries according to online availability, sophistication of the services and user experience. According to the survey report, these indicators were defined as follows:

- **Full online availability:** Accessing the online services (especially 20 key public services) whether they are fully automated or not.

- **Online sophistication:** It is related with the interaction and/or transaction among the administration, citizens or businesses. This measure contains 20 main public services such as online tax filing, obtaining permits, education services and etc.

- **Portal sophistication:** Identifying the most mature, user-centric and personalized portals that provide direct access to a wide range e-Government services.

- **User experience:** It is related with ease of use. This covers aspects of usability, transparency, privacy and feedback.

Turkey was a newcomer to the EU Online Public Service Availability survey in 2010. Turkey's achievement in full online availability is shown in the Table 2-6.

Table 2- 6 EU Online Public Service Availability Survey Results

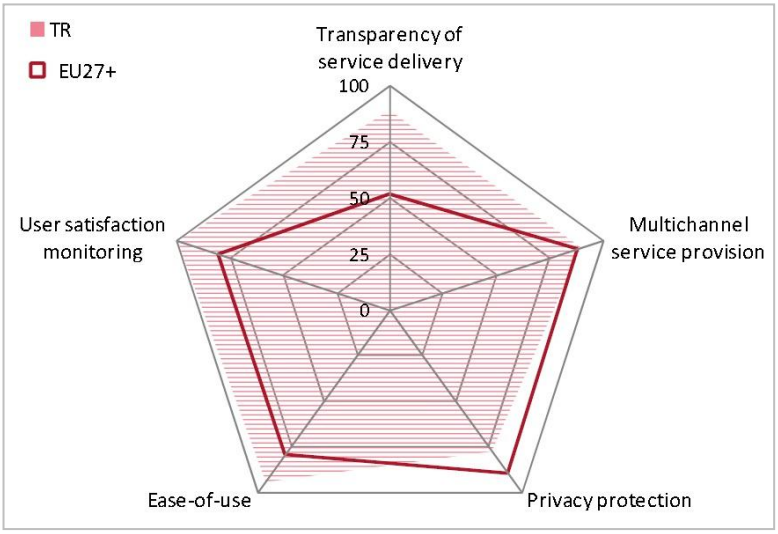
Aggregate Country Performance				
	20 services		User experience	
	Full online availability 2010	Sophistication 2010	User experience (average on all services)	User experience (national portal)
Turkey Average	89	91	80	90
Overall Average	82	89	79	79

The survey demonstrates that Turkey score is better than the overall average in 2010. For instance, Turkey's full online availability (89 %) is above the EU online availability average (82%) which is shown in Table 2-6. The ranking of Turkey is 17th of the 32 countries.

A great number of studies were conducted to find out user satisfaction of e-government services and portals. User experience of e-government services were evaluated in terms of:

- Transparency of service delivery,
- User satisfaction monitoring,
- Multichannel service provision,
- Ease-of-use, and
- Privacy protection.

Turkey's efforts about above items are presented in the Figure 2-3.



Source: Digitizing Public Services in Europe 2010

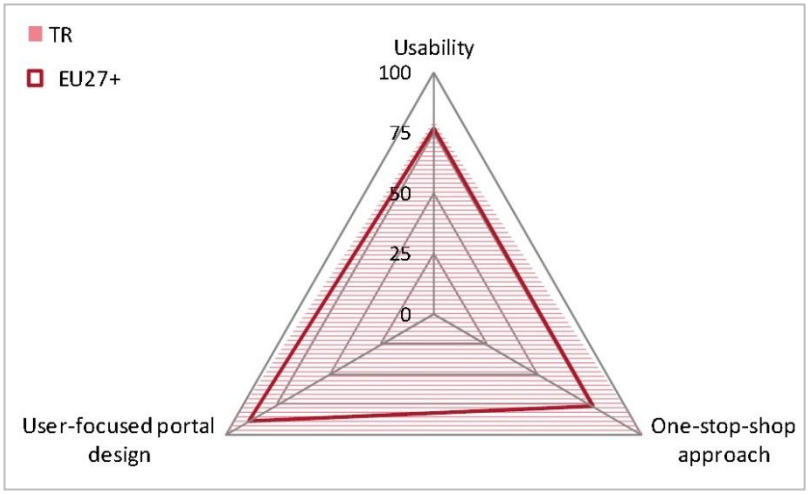
Figure 2- 3 User Experience Result of E-government Services in Turkey

The results show that, Turkey's efforts about the transparency of service delivery, user satisfaction monitoring, multi-channel service provision and ease-of-use are better than the average scores. On the other hand, Turkey's effort is less than the average score in privacy policy area.

User experience of e-government portals were evaluated in terms of:

- Usability
- User-focused portal design
- One-stop-shop approach

Turkey's efforts about above items are presented in the Figure 2-4.



Source: Digitizing Public Services in Europe, 2010

Figure 2- 4 User Experience Result of E-government Portals in Turkey

The results show that, Turkey's efforts about user-focused portal design and one-stop-shop approach are better than the average scores. Moreover, the survey indicates that Turkey has achieved the same usability performance with the average score.

The study also indicates the strategic priorities for each country. Turkey's strategic priorities are listed as bellow in this study conducted in December 2010:

- Provide interoperability of e-government services such as information sharing between public agencies, common databases, infrastructures and services. Provide integrated and multi channel public services.

- Reengineering business processes to facilitate application and reduce bureaucracy.

- Focus on the user orientation, user satisfaction, data privacy and protection, participation and transparency.

2.5.3 Waseda University the World e-Government Ranking

Japan Waseda University Institute of e- Government has conducted a study to monitor and evaluate approximately 40 countries' e-government performance since 2005. Each country is graded according to measurement criteria for an "ideal e-government". The study includes 26 indicators distributed over six areas, these are network preparedness, required interface functioning applications, management optimization, Chief Information Officer (CIO) in Government, homepage/portal situation and promotion of e-government (Waseda University the World e-Government Ranking, 2010).

Network preparedness: It examines existing technical infrastructure. The study areas of this field are internet users, broadband users, digital mobile users, PC users and security of the systems.

Required Interface functioning applications: Online applications, e-tax systems, e-voting systems, e-payment systems are investigated under this measurement area.

Management optimization: This field focuses on the management within government through related indicators such as system optimization, integrated network system, administrative and budgetary systems, and public management reform by ICT.

Chief Information Officer (CIO) in Government: This field is related to introduction of CIO for transforming organizations. Role and function of CIO, and supporting body built for CIO are assessed.

Homepage: This area is related to updates, link navigation system, public disclosure and multi-language correspondence.

Promotion of e-government: This area examines e-government related priority of planning and strategy, promotion activities, legal framework, and evaluation system. Turkey was first added to the survey in 2010. The two years result of the Turkey are revealed in Figure 2-5.

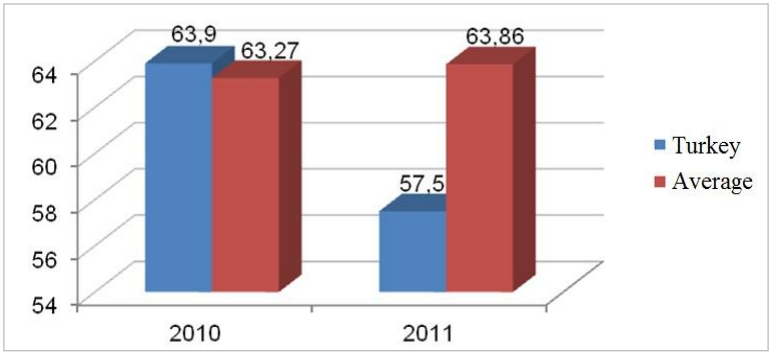


Figure 2- 5 Waseda University the World e-Government Survey

Turkey's scored in 2010 was 63.9 over 100. This result was higher than the average score. In 2010, 40 countries' e-government performances were evaluated. Turkey's ranking was 23 over 40 countries. On the other hand, in 2011, 50 countries were included in to the study and Turkey's ranking was 33. Turkey's score also decreased 63,9 to the 57,5 in 2011. This decrease can be related to new evaluation field of the study that is e-Participation**.** This new field examines the e-information and mechanisms, consultation and decision-making process e-government websites (Waseda University the World e-Government Ranking, 2011).

2.6 E-Government Studies in Turkey

In order to be a member of "Information Society", Turkey has started to work on information technology and to understand its effects since early 2000s. In 27th February of 2003, Government developed an urgent action plan which is about "E-

Transformations of Turkey Project". This project's aim was detailed in Turkish Court of Accounts Report. According to this report (SPO, 2006):

> *"E-Transformation Turkey Project aims to carry out the process of transformation into an information society in a harmonious and integrated structure all over the society with all citizens, enterprises and public segments".*

In addition, the vision of the project was defined as follows (SPO, 2006):

> *"To be a country that has become a focal point in the production of science and technology, that uses information and technology as an effective tool, that produces more value with information-based decision-making processes and that is successful in global competition, with a high level of welfare".*

E-Government issue is the critical part of the E-Transformation Turkey Project. It is targeted to develop citizen-focused services delivery and to provide high standards of public services. In order to achieve this goal, lots of progress has been made since 2000. The main studies are listed as follows:

- State Planning Organization Principles of Interoperability - 2005
- State Planning Organization Information Society Strategy - 2006
- Website Guide for Public Institutions - 2006
- Comptroller Presidency Study - 2006
- Türksat Website Standards and Recommendations Guidebook - 2009
- National Statistical Institute Information Society Statistic - 2011
- Individual studies about e-government website evaluation in terms of performance, usability and accessibility.

2.6.1 State Planning Organization Principles of Interoperability - 2005

The interoperability frameworks of Turkish e-government websites have been studied from Information Society Department of State Planning Organization (SPO) since 2005. SPO published principles of interoperability guideline which mainly focused on the rules to share information and documents on electronic media among government agencies.

The guideline composed of six main sections, these sections were: data representation and exchange, interconnection, process and data integration and content management, security, geographic information systems. This study aimed to define authority, methods, processes and technical standards of the electronic services. The guidebook provided detailed information in different areas such as:

- Zip file formats (zip, tar, 7z),
- Presentation document formats (html, pdf, ppt),
- Data transformation protocols (FTP RFC 2228, RFC 2640), and
- Process modeling (Process Chain Diagram, UML).

A Principle of Interoperability Guideline version 1 was prepared in 2005. According to today's needs, the guideline was updated. The second version was released in 2009.

2.6.2 State Planning Organization Information Society Strategy - 2006

The Information Society Strategy and Action Plan, which covered the period from 2006 to 2010, determined the priorities of Turkey in the process of the transformation and defined the steps that should be taken.

The Information Society Strategy Measurement Document was prepared in this study. The document contained 117 indicators with the aim of enabling designers to evaluate their websites.

2.6.3 Website Guide for Public Institutions - 2006

The guideline was intended to provide design recommendations for e-government websites to be accessible for a wider audience. The study mainly consisted of four sections, these are:

- **Content:** In this section, content-oriented recommendations were given. For example, it was mentioned that aims of the websites, organizations of agencies, responsibilities of the agencies, feedback mechanisms and frequently asked questions must be included in the e-government website.

- **Design:** In this section, the design criteria were proposed for the preparation of the e-government website. It was a comprehensive section that provided recommendations about accessibility, technical features, general appearance and some automated test processes.

- **Publishing**: This section included recommendations about the publication process of the e-government website. It gave information about the domain name, continuity of the connection, security and backup.

- **Accessibility Control:** This section guided e-government institutes to make accessibility evaluation according to Web Accessibility Initiative (WAI) Web Content Accessibility Guidelines (WCAG).

2.6.4 Comptroller Presidency Study

Government agency desired to asses performance and quality of the offered electronic services. For this reason, Comptroller Presidency conducted a study and published a performance report in 2006. In this study 32 e-government websites were evaluated for four categories (design, roaming, content and accessibility) and 32 evaluation criteria. Table 2-7 illustrates the some criteria examples for each category.

They also made an interview with 37 government institutes and made a questionnaire that includes 74 questions. They brought to light government institutes' approach while developing e-government website. For example, they asked whether government agencies get users needs or not, and whether they simplify their work processes or not.

Table 2- 7 Website evaluation criteria of Comptroller Presidency Study

Design
1. Main page should be restrained, clear and understandable.
2. Webpage should not include unnecessary pictures, videos and links.
3. Webpage layout should be consistent for all pages.
4. Appropriate fonts should be used to provide readability
5. All windows should have a title
Roaming
6. Sitemap should be located in the main page.
7. All pages should contain a main page link.
8. Users should be directed easily with the help of navigation arrows.
Content
9. Website should contain communication information such as telephone number for the website problems.
10. Agency logo should exist in the website.
11. Website should be printable.
12. Website's update date should be declared in the website.
Accessibility
13. Website should be usable for people that are not able to see.
14. Website should be usable for people that are not able to hear.
15. Website should be work with different web browser.

According to results, they took an action plan which summarizes as follows:

- Determining to prepare e-government websites' standards.
- **Usage of offered information services in the e-government website:** They aimed to enhance service's scope and quality. They also purposed to evaluate users expectation in this process.
- **Reconstructing work process:** The bureaucracy must be decreased and work processes must be simplified.
- **Updating e-government website and assessing usage rate of the website:** All information must be up to date. Also, users' expectations and needs must be collected and users' characteristic must be consider.
- **Security:** All government agencies must develop information security policies.

2.6.5 TÜRKSAT Guidebook:

The important result of the Comptroller Presidency study was the decision of the preparing e-government websites standards in Turkey. The Government Planning Agency was responsible for this study. The institute worked with Türksat. In 2009, Türksat developed a "Kamu Kurumları İnternet Siteleri Standartları ve Önerileri Rehberi" and all government agencies were informed and expected to develop a website with the guidance of this standard. The study consisted of 20 sections; these are; usability, accessibility, software and hardware, usage improvement, main page, page layout, navigation, scrollbar and inside page navigation, inside page titles and website titles, links, text appearance, lists/tables, data inputs - display-based controls, image and multimedia elements, search, contact, archive and personal information privacy and security.

Each section was described in detailed, right and wrong examples were given. The guidebook also provided some automated tools for the website designers such as website color checker, accessibility checker, code quality checker and etc.

2.6.6 National Statistical Institute:

National Statistical Institute is responsible to search the ICT usage in Turkey such as rate of internet access, PC usage, e-government websites usage, ICT investment rate and etc. The recent statistics have been released in 2011. Some statistical results are examined as follows:

ICT Usage 2007 - 2011: From 2000s, technology has become an important role in people life in Turkey. Internet has changed people life style. Most usage area of the internet are: reading the newspaper or magazine, make shopping, getting information from government institutes, involving social network and etc. Moreover, Internet access rate has rapidly increased.

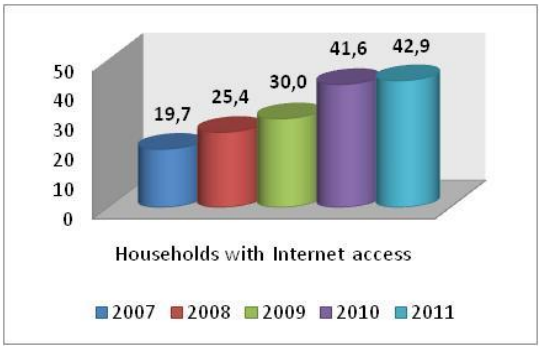


Figure 2- 6 Households with internet access

According to National Statistical Institute, 42,9% people had internet access at their home in 2011. (Figure 2-6). Also, as shown in Figure 2-7, 45% of 17 - 75 age group people in Turkey used internet.

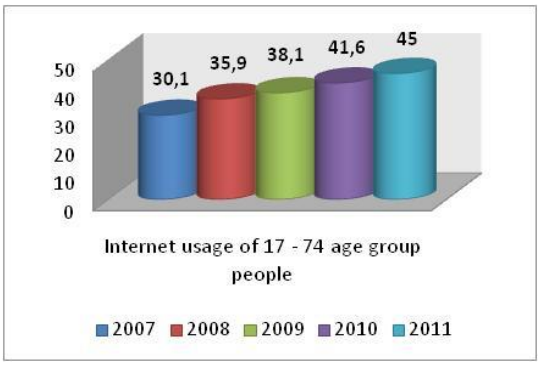


Figure 2- 7 Internet usage of 17-74 age group people

These results show that most of Turkish people get familiar with the technology. Although there are still some problems about technology acceptance, these problems have not been covered in this study.

2.6.7 Individual Studies

In Turkey, there have not been comprehensive studies that focus on user-centered design and evaluation. For this reason, this thesis examines the most related studies such as usability and accessibility in the remaining part of this section.

Usability Problems in terms of Citizens' Perspective:

This study conducted usability test of six government agencies' websites: these were Ministry of National Education, Turkish National Police, Ministry of Health, General Directorate of Civil Registration and Nationality, Turkish Telecommunication Institute and Greater Municipality of Ankara (Akıncı & Çağıltay, 2005). There were six participants in this study. Participants were asked to complete three tasks that were particular to these websites.

Although all participants were computer literate, they were still faced with problems that they could not complete the transaction. According to this study results, commonly experienced problems were found in menu design, link titles, content design, non-functional search boxes and inactive links. In addition, participants commented that the web page and content design of the government websites were the determining factor in the successful, productive and continual use of e-government websites.

The study provided some recommendations to decrease these problems. It was stated that usability tests should be conducted more systematic and intensive way in order to prevent these problems. It encouraged the user-centered design that increases the communication between the users and governments.

Measurement of Web Usability: Web Page of Hacettepe University Department of Information Management

This study examined the usability issues of the website. It conducted a usability evaluation of the Hacettepe University, Department of Information Management website with seven users from different levels.

In order to assess usability of the website, qualitative and quantitative methods were used. The studies composed of three stages, these stages were; pre-test, usability study and final test.

In the pre-test stage, users' general computer and internet skills were investigated. 71,4 % of participants stated that they have sufficient computer and internet skills. In the second stage, usability study was conducted. Fourteen tasks were given to the uses. It was requested from the users to think aloud. Users' comments were collected while they conducting the tasks. Clicking numbers and retrieval time were also recorded. The result of task completion rate was 76,5 %.

In the third stage, a final test was implemented to users in order to find out the ideas of users about Hacettepe University, Department of Information Management website. 71,4 % users found website's menu partially sufficient and remaining users think that the website was sufficient.

At the end of the study, the authors provided the recommendations to enhance the usability of the websites:

- The search options ease to access information in the websites.
- Announcement sections must be sort according to date.
- It is better to reach important items in the website more than one links.
- The website language must be clear and understandable.
- The menu organization must be hierarchical.

Provision of Website Accessibility for the Visually Impaired

This study focused on the accessibility issues of visually impaired people. In order to make accessible website, there must be awareness of disabled people's specific needs. Accessing online services is more critical for disabled people than others. Because, it enables disabled people to perform operations in digital media without help of another person, it is a big opportunity for them (Acartürk & Yücel, 2006).

The study focused on the problems, which blind people come across while using computers and visiting websites. The study findings are listed as bellow:

- The websites do not contain alternative presentations for the non-text items such as images, videos and simulations.
- The screen reader programs cannot read the applets, scripts and etc.
- The captcha structures with audible options are not used by the websites.

At the end of the study, some suggestions were proposed in order to make websites accessible by visually disabled people. These suggestions are:

- The institutes must be informed about the importance of the accessibility issues for the disabled people. They must be aware of the disabled people's problems while using e-government websites.
- The government institutions should provide alternative websites options for the disabled people.
- The screen reader programs must be prepared with the Turkish language options.
- The e-government websites should be controlled with accessibility checker programs. The websites should be designed according to W3A - WAI accessibility standards.
- The labels and images that strain eyes (blink and so on.) should be avoided.
- Short cut keys must be available.
- There must be consistency between pages within the website.

Web Accessibility and e-Democracy

According to Şat study that was conducted in 2011, e-Government applications provide new opportunities about active citizens' participation for political, democratic and governance processes that is called e-Democracy.

Democracy is a platform, where individuals and groups of individuals can express themselves. However, disabled people are subject to difficulties to achieve these platforms and express themselves. They cannot use their democratic rights.

In this study, accessibility issues of the seven e-government websites were evaluated by focusing on blind people's problems. These websites are:

- e-Government Gateway
- Social Security Institution
- The Post and Telegraph Organization
- Student Selection and Placement Centre
- Ministry of National Education
- Ministry of National Education e-School project
- Ministry of Public Works and Settlement

The evaluation was made according to W3C accessibility principles. In addition, CSS validation tool and color filter software were used to test the websites.

The results showed that most of evaluated websites did not fulfill the accessibility standards. The following problems were encountered during the accessibility evaluation:

- Different text size alternatives were not provided.
- Foreground and background separation was not efficient.
- There was not a special text based page for blind users.
- Shortcut keys did not work.
- The website did not guide users to determine where they are.

- There was some fast streaming text based information that made reading difficult for most of the people.

2. 7 Literature Review Results

As mentioned above, there is a gap in literature about public agencies' websites evaluation. Especially, governments need to learn whether their electronic services are successful or not. The study conducts this evaluation as a user-centered view. There has not been any comprehensive study in the literature within user-centered e-government website evaluation context in Turkey.

CHAPTER – 3

METHODOLOGY

This chapter introduces the methodology of the thesis. It describes the data collection and data analysis method. It also focuses on reliability and validity of the study and finally it provides limitations and problems about this study.

3.1 Data Collection Method

Data is collected with website evaluation tool and questionnaire.

3.1.1 Website Evaluation Tool

This study aims to evaluate Turkish e-Government websites in terms of user-centeredness. User centered design is a systematic approach that contains functionality, usability and accessibility. Government agencies need to evaluate their websites based on these aspects.

Türksat study is a comprehensive example that provides a guideline to evaluate many aspects of website design. The study also derives an evaluation tool according to this guideline. This tool is shared with government agencies to make self assessments of websites. It is useful to conduct a detailed assessment of the e-government websites. As an evaluation instrument - the questionnaire residents in a spreadsheet and contains 127 questions. This thesis is based on Türksat website evaluation tool and

made some changes on the tool. The original tool composes of 20 sections. These sections are:

1. **Recommendations:** This section provides general guidance about the design phase of the e-government website. To illustrate, determining the target audience needs and designing the webpage according to these needs are advised.

2. **Accessibility:** This section assesses the website whether it satisfies the basic accessibility requirements. The instrument mainly covers the Web Content Accessibility Guideline priority 1 requirements.

3. **Software and hardware:** This section assesses whether designers should take into account information access limitation problems due to software, hardware and internet connection speed. The designers should determine the minimum requirements for hardware and software to be used by end-users

4. **Usage improvement:** This section is related to cognitive load of the website. It aims to evaluate website hierarchy, used terminology, error messages and website help functions. In this section, page load time, file and directory naming and page printing layout are taken into consideration.

5. **Home page**: A well-designed home page creates a positive impression on the users. The tool assesses the website homepage whether it has clear and understandable design, it contains the general aim of the website, it provides effective navigation and etc.

6. **Page layout:** This section mainly focuses on the placement of each item that is ordered according to the importance in the page. It also assesses appropriate usage of page and line lengths.

7. **Navigation:** Users can reach information easily if navigation structure is designed effectively. This section examines the navigation structure of the website such as previous/next page navigation links, site map, home page links and etc.

8. **Text Appearance:** This section examines the website according to font sizes, font types, color contrasts of background and foreground and consistency of text appearance.

9. **Scrollbar and inside page navigation:** This section assesses that users are able to move between pages efficiently. It is expected from websites to avoid the horizontal scroll.

10. **Inside Page Titles and Website Titles:** A well designed page headlines facilitate reading and finding information. This section evaluates the convenience of these features.

11. **Links:** The website should enable users finding links easily for the specific purposes.

12. **Lists/tables:** This section assesses whether lists and tables are prepared easily understandable such as topics of the lists and tables should have explanations.

13. **Data Inputs - Display-Based Controls:** Users need display-based controls to interact with the website. This section assesses usability and effectiveness of these controls such as radio buttons, check box, input areas labels and etc.

14. **Image and Multimedia Elements:** The most noticeable items in websites are images. This section accesses whether image size, website logo, background image appropriate or not.

15. **Search:** This section assesses the search functionality of the website. It also focuses on the content search with basic and detailed options.

16. **Contact:** Websites allow users to communicate with Government Agencies. This section checks whether the website contains a phone number, an e-mail address and communication forms.

17. **Metadata:** Metadata is the universal data stack that contains information such as used language, author, keywords and descriptions. These records also facilitate displaying in the search engine.

18. **Website Content Archiving:** This section evaluates the archiving systems of the website.

19. **Personal Information Privacy and Security:** This section focuses on website privacy and security policies. It checks whether websites contain SSL and 3D secure protocols.

20. **Publication of Website:** It assesses appropriateness of the website domain name and usage of the alternative domain names.

The same assessment scales are used for all questions. There are three choices: "Yes" (means the feature exists), "No" (means the feature does not exist), and “Partially" (means some parts of the feature exist). The weight of the each choice is determined as follows:

- Yes - 2 point
- No - 0 point
- Partially - 1 point

The tool provides two types of results. One of them is arithmetical average, which is summing the points and dividing summation result to the maximum points. The other result type is section based weighted average. Each section has weights according to

their importance (shown in Table 3-1). This tool allows users modifying the weights according to their needs. The averages are calculated for each section separately by using these weights.

Table 3- 1 Categories Weight in Türksat Study

Categories	Weight %	
1. Recommendation	0	%
2. Accessibility	5	%
3. Software and Hardware	5	%
4. Usage Improvement	5	%
5. Homepage	5	%
6. Page Layout	5	%
7. Navigation	7	%
8. Scrollbar and Inside Page Navigation	6	%
9. Inside Page Titles and Website Titles	7	%
10. Links	7	%
11. Text Appearance	5	%
12. Lists/Tables	5	%
13. Data Inputs - Display-Based Controls	5	%
14. Image and Multimedia Elements	5	%
15. Search	3	%
16. Contact	9	%
17. Metadata	3	%
18. Website Content Archiving	3	%
19. Personal Information Privacy and Security	5	%
20. Publication of Website	5	%
Total Weight	**100**	**%**

3.1.2 Website Evaluation Tool Modification

The evaluation instrument contains fundamental features of the website. This tool is given to the government agencies to self assess their websites according to Türksat Guidebook. So that, it was not used for a comprehensive study like this thesis, that is 33 websites are evaluated and results are compared. Moreover, the rapid development of the technology has added some new features to websites; some of the

items have become obsolete for evaluation. Other factors also contribute to this issue like changes in government policies or regulations. For all these reasons, some changes are applied to update tools according to today's needs. The changes are described as follows:

- There are three answer options "Yes", "No", "Partially". However, these options are not enough for all questions. Some features in the evaluation tools are not applicable for all e-government websites. For example, the question "Are file and directory names written with a lowercase letter?" is not applicable for all websites. If a website does not need to provide a file or directory, it does not contain any file and directory. At this time, evaluation will be unfair, because, evaluating these features with a "No" option decreases the website overall average. Therefore, tool does not mention the accurate performance of the website. For this reason, the "Not Applicable" option is added into the tool. If this choice is selected, the related question is not calculated in average.

- In the tool, more than one question is asked in the same line. For example:

    - Is website tested with computers that have different features? Does website work without installing additional software?

  Above two questions are related with different features of the website. Moreover, it is not correct to evaluate these questions together. There are seven items in the tools that possess the same situation. All these questions are separated and asked in a new line. So that, the evaluation becomes more accurate.

- The instrument's aim is providing government agencies self-evaluation tool. With this purpose, some questions are directly prepared for the website designer. For example,
    - Standardization of the website loading times:

- Is there any software used for page load time detection?
- Are there any tasks which are conducted in order to identify and improve long page load time?

This thesis modifies the tool for any user that evaluates the e-government website in terms of user centered approach. For this reason, the designer and the developer specific questions are eliminated in modified tool.

- The Lists/Tables section in the tool is not common for the most websites. For this reason, this section is removed from the instrument.

- Some questions' sections are changed and some repeated questions are eliminated. After that, the category weights are updated according to importance. This thesis focuses on user-centered approach, therefore the related category weights are increased accordingly. The updated category weights are displayed in Table 3-2. The tool allows modifying category weight according to purpose of the study.

Table 3- 2 Updated Categories Weight in this Study

Categories	Weight %	
1. Accessibility	7	%
2. Software and Hardware	6	%
3. Usage Improvement	7	%
4. Homepage	6	%
5. Page Layout	5	%
6. Navigation	6	%
7. Scrollbar and Inside Page Navigation	5	%
8. Inside Page Titles and Website Titles	4	%
9. Links	6	%
10. Text Appearance	6	%
11. Data Inputs - Display-Based Controls	7	%
12. Image and Multimedia Elements	4	%
13. Search	5	%
14. Contact	7	%

Table 3- 2 (cont.)

Categories	Weight %	
15. Metadata	4	%
16. Website Content Archiving	4	%
17. Personal Information Privacy and Security	7	%
18. Publication of Website	4	%
Total Weight	**100**	**%**

- After completion of the tool arrangements, the instrument was examined by three domain experts. One of them was Dr. Umut TÜRKARSLAN, he conducted a detailed evaluation and advised to:
    - Remove some questions that are very general and detailed and covered in the other questions,
    - Reorganize sentences, and
    - Correct some spelling errors.

- Another person was Gülgün AFACAN, she conducted an e-government performance evaluation study, her analysis results are listed as follows:
    - Advice to detail some sections,
    - Reorganize the questions' choices.

- Prof. Dr. Kürşat ÇAĞILTAY controlled the appropriateness of the whole instrument.

3.1.3 Evaluated Website Selection

This thesis intends to make an extensive study and selects 33 Turkish e-government website from different services such as finance, health, education, security, religion, transportation and etc.

Website selection method was a detailed process that consisted of several steps.

- Comptroller Presidency Study performed a study; they evaluated 32 e-government services with design, roaming, content and accessibility

perspectives. This study took Comptroller Presidency Study evaluated websites list as a reference.

- After that, E-government Gateway websites were examined. In this website, "Most used Web Pages" and "E-government Main Agencies" lists existed. Remaining websites were selected according to these lists.

- After completing the list, offered services of each website was found out. It is investigated that some websites are only designed for giving information about agency, some of them provide e-services such as online tax payment, document tracking, job application, online appointment and etc. This thesis preferred to select websites that provide online e-government services. The remaining websites only give information but some of them are important like Presidency of Republic of Turkey's website, it is a representative of the Turkish Government Agencies. Moreover, most of international studies examine this type of websites to decide country performance. For this reason, this thesis also examines the Presidency of Republic of Turkey's website, Prime Minister of Republic of Turkey's website, Grand National Assembly of Turkey's website. So that, the list is shaped with 33 e-government website in different service areas. The list and detailed information of the websites are given in the Table 3-3. The listed websites' screenshots were taken on 21st November 2011.

Table 3- 3 List of Evaluated Website (November, 21, 2011)

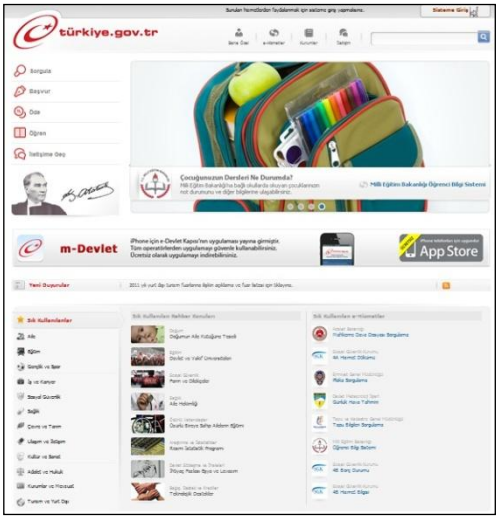
E-Government Websites in Turkey	
Turkey E-Government Gateway - http://www.turkiye.gov.tr E-government gateway aims to provide fast, unified and secure services in a single point of access. The website is designed according to user needs. E-government gateway provides the integrated services from different government agencies such as: • Ministry of Justice, • Social Security Institute, • General Directorate of Security, and • State Meteorology Affairs.	
Ministry of Justice - www.adalet.gov.tr The main objective of this project is automation of all the judicial units and integration with the external units to achieve high quality services in justice. The website provides following services: • Ministry of Justice - Law Dictionary, • National Judicial Network Project (UYAP).	
Prime Ministry of Turkey - www.basbakanlik.gov.tr The website aims to serve information about Prime Minister program and activities. Also, the website provides following services: • Legislative Information System, and • Formal Newspaper.	

Table 3- 3 (cont.)

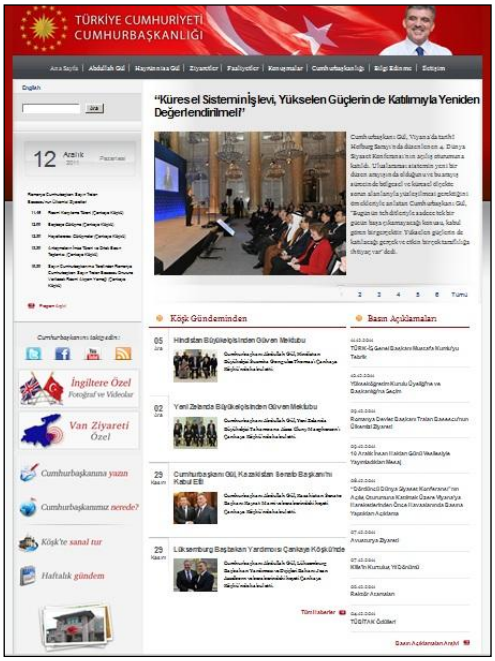
E-Government Websites in Turkey	
Ministry of Science, Industry and Technology - http://www.sanayi.gov.tr The website contains development plans and annual programs, Ministry goals and policies. The website also provides following e-government services: • The Consumer Portal, and • The Consumer Complaints Application.	
Presidency of the Republic of Turkey - http://www.tccb.gov.tr/ Te website provides the information Turkey Republic President agenda, speeches, news, projects and etc. Website also contains the "Communication" part that allows citizens send a message to the Turkey Republic President.	
Ministry of Labor and Social Security - http://www.csgb.gov.tr The website released rules and regulations of working life. It also provides beneficial information about worker-employer relations, occupational health and safety arrange and social security. It directs workers in order to protect and improve their rights in working life.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
Ministry of Environment and Urbanism - http://www.cevresehircilik.gov.tr The website serves information about environmental protection and improvement principles and policies, standards and criteria for landscaping, programs to improve environment. The website also provides following services: • Energy Efficiency in Buildings, • Control system of the Public Buildings, • Construction Auditing System, • List of Building Materials Market Prices, and • Construction Analysis and Unit Prices.	
Undersecretariat of Maritime - http:// www.denizcilik.gov.tr The website gives information about the Ministry comprehensive activities in the following areas: • Development of maritime sector and trade, • To improve yacht tourism and to increase the number of yacht ports, • To increase safety in the Turkish seas and straits. The website also provides some e-government services, such as: • Document Tracking System, • Ship Agents Authorization Certificate Inquiry, and	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
• Ship building Industry Database Program.	
Government Archives http://www.devletarsivleri.gov.tr The website serves the historical information about the country and geography. It has an online catalogue search functions. It also contains achieve catalogues and central information systems.	
State Personnel Presidency http://www.dpb.gov.tr The website provides the information about the annual recruitment plan. It also announces the latest vacancy in the government agencies. It contains regulations search e-government service.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
Ministry of Foreign Affairs http://www.disisleri.gov.tr The website informs the users about the foreign policy of the Turkish Republic. It also provides information about the relations with Republic of Turkey and foreign states and international organizations. The website provides some e-government services, these are e-consulship, international agreement database and catalogue search.	
Ministry of National Education http://www.meb.gov.tr The website gives information about Turkish Education Systems rules and regulations. It also provides important services that are used by many people, these e-government services are: • Student Information System, • Exam Results Inquiry, and • Exam Place Inquiry.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
The Presidency of Religious Affairs http://www.diyanet.gov.tr The website gives information about beliefs of the Islamic faith, worship and moral principles. The website also provides following e-government services: • Information System of Religious Questions Respond Commission, • Hajj Application Status Query, and • Prayer Times.	
Ministry of National Defense http://www.msb.gov.tr The website gives information about national defense duties and policies. The website provides the e-governments services in the e-government gateway (www.turkiye.gov.tr). Registration procedures for military service and application for the information acquisition are the examples of the offered services.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
Ministry of Economy http://www.ekonomi.gov.tr The website enlightens the citizens about the economic studies in Turkey. It also provides some e-government services about the trade such as: • Turkish Exporters' Guide, • Information Foreign Demands, and • Product Safety Database.	
Turkish National Police http://www.emniyet.gov.tr This website gives important information about citizens' safety. The website provides the following e-government services: • Missing Child Search, • Missing Persons, • Online Notice, • Passport Application, • Driver's License Application, and • Application of Human Rights Violation.	

Table 3- 3 (cont.)

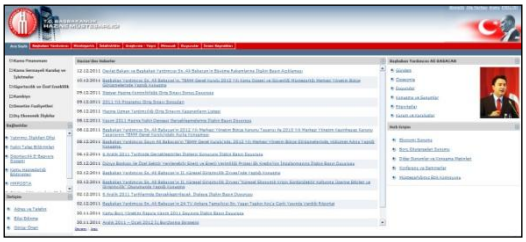
E-Government Websites in Turkey	
Revenue Administration http://www.gib.gov.tr The website provides information about the Turkish Tax System and offered online application to inquiry and pays the taxes. Some of e-government services listed as follows: • Late tax penalty calculation, • Income tax calculator, • Motor vehicle insurance value calculator, • Motor vehicle query, • Motor vehicle tax calculator, • Tax payment, and • Tax identification number query.	
Undersecretariat of Treasury http://www.hazine.gov.tr Web page provides information about economic policy, activities and Foreign Economic Relations.	

Table 3- 3 (cont.)

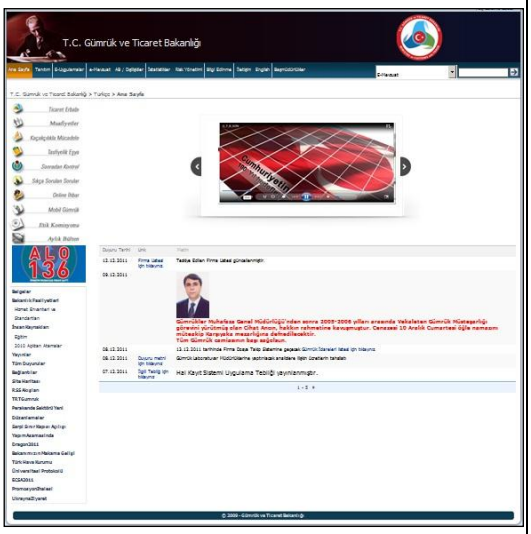
E-Government Websites in Turkey	
Ministry of Food, Agriculture and Stockbreeding http://www.tarim.gov.tr It is an informative page that is related to: • Improvement of crop and animal production, • Development of production of aquaculture, and • Food safety.	
Ministry of Customs and Trade http://http://www.gumruk.gov.tr The website provides the rules and regulations of the customs policy. It also offers some e-government services, such as: • Electronic Declaration, • Firms File Tracking System, • Ship Tracking System, • Customs Enforcement Notice, and • Tax Inquiry.	

Table 3- 3 (cont.)

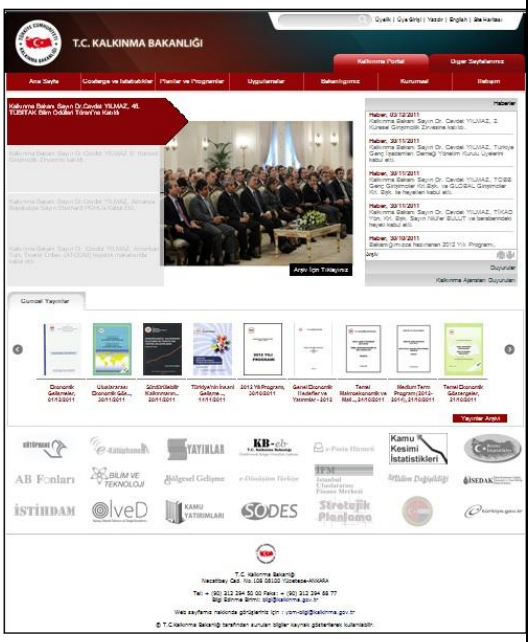
E-Government Websites in Turkey	
Ministry of Interior http://www.icisleri.gov.tr Ministry of Interior has comprehensive responsibilities such as internal services, social services, populations and citizenships and security services. The ministry website contains information about all these services. It also has some e-government services, such as: • E-icisleri projects document tracking, • Green card application status tracking, • Gendarmerie online notice, and • Human rights violation notice application.	
Ministry of Development http://www.dpt.gov.tr The website gives information about Turkish development plans and programs. The website also provides some economical statistic.	

Table 3- 3 (cont.)

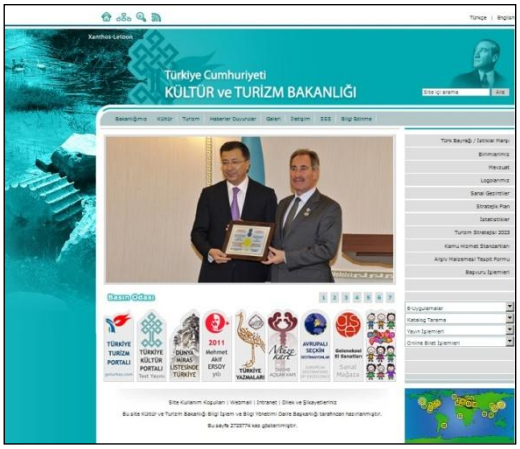
E-Government Websites in Turkey	
Ministry of Culture and Tourism http://www.kultur.gov.tr The website introduces Turkish Culture and touristic places. The website also provides following online services: • State Theatre Online Ticket Sales, • e-Book.	
Ministry of Finance http://www.maliye.gov.tr The website gives information about Ministry Finance policies, news and announcements. It also provides the following services: • E-Library, and • E- Proclamation.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
Ministry of Forestry and Water Affairs http://www.ormansu.gov.tr The website introduces the projects about the forest and biological life protections. It also provides the following e-government services: • Waste Packaging System, • Chemicals Data Bank, • Imports of Ozone Depleting Substances, • Hazardous Waste Declaration System, and • e-Environmental Permits.	
Ministry of Health http://www.saglik.gov.tr Website provides crucial information in order to: • Improve health conditions of the country, • Raise awareness for contagions, • Raise awareness to decrease illness rate. The website provides following e-government services: • Doctor Data Bank, • Document Tracking Program, • Application for Patient Rights, and • Green Card Accrual Information System.	

Table 3- 3 (cont.)

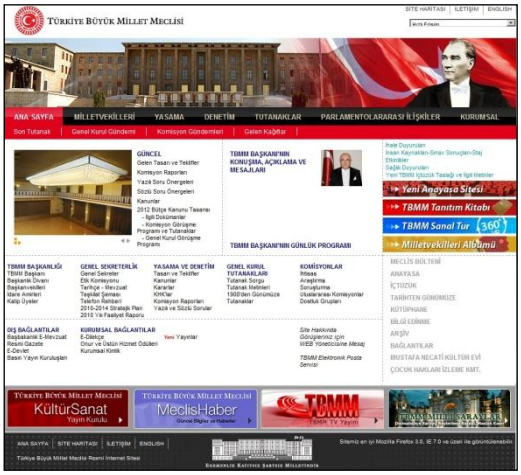
E-Government Websites in Turkey	
Social Security Institute http://www.sgk.gov.tr It is an informative website about Social Security. E-government services of the social security Institute are provided in the e-government gateway.	
General Directorate of Land Registry and Cadastre http://web.tkgm.gov.tr The website provides information regarding an immovable items and deed processes. It also provides following e-government services: • Online appointment, and • TAKBİS Portal.	
Grand National Assembly of Turkey http://www.tbmm.gov.tr The website provides the information Grand National Assembly of Turkey programs, laws and legislation.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
National Statistics Institute http://www.tuik.gov.tr This website serves the Institute' statistic studies in comprehensive area, such as: • Information Systems, • Agriculture, • Finance, and • Labor.	
Ministry of Transmission, Marine and Communication http://www.ubak.gov.tr The website provides the information about the Ministry services and continuing projects. It also contains the linkage to the some e- government services such as. • Online train ticket selling, • Telecommunication System, and • General Directorate of Civil Aviation.	

Table 3- 3 (cont.)

E-Government Websites in Turkey	
Turkey Labor Agency http://www.iskur.gov.tr/ The website brings together the employers and employees for job applications. The website also provides citizens to apply unemployment pay. It also gives some beneficial information to find a job.	
Government Meteorology General Directorate http://www.dmi.gov.tr This website provides useful information about the meteorology such that: • Marina Estimation, • Weather Condition Estimation, • Timely Radar Pictures, and • Timely Satellite Pictures.	

3.1.4 Questionnaire

E-government evaluation instrument is used for assessing e-government website performance in terms of the user view. Beside user view, this thesis has purpose to investigate designer and developer approach to the user centeredness. It is tried to find out user involvement to designing, development and maintenance phase of e-government websites. For this reason, a questionnaire is prepared for the people or

units that are responsible for maintaining the e-government website. The questionnaire consists of five sections. These are participant information, functional evaluation, usability evaluation, accessibility evaluation, and general questions (see Appendix A).

- **Functional Evaluation**: This section intends to find out how designers determine website's aims, website's tasks, audience, audience needs and expectations.

- **Usability Evaluation:** This section focuses on usability studies of the website. It contains questions about how designers determine usability objectives, how they conduct usability testing, which standards they use for usability and etc.

- **Accessibility Evaluation:** This section focuses on the accessibility issues of the website such as whether the designers conduct accessibility studies for the website, or they use a standard, or they make usability tests with disabled people.

- **General Questions:** In this section, it is tried to find out general characteristics of e-government websites such as security, publication, maintenance and etc.

The questionnaire is also controlled by two specialists. They give comments to simplify the questions.

3.2 Data Collection

Data collection process is described in this section.

3.2.1 Data Collection with Website Evaluation Instrument

The modified tool consists of 18 sections; each section focuses on different characteristics of the website. In order to make an accurate outcome, the evaluation was conducted for all websites for section by section. The evaluation started with accessibility section. In this section, the detailed examination must be conducted in order to answers each questions. Besides this, special software tools were used. For these reasons, evaluation was performed question by question. For example, for the first question (Is website prepared in accordance with W3C priority 1 requirements?), 33 websites were evaluated then skipped to the next question. This method took more time but helped to give same answers in the same conditions.

On the other hand, there was no need to conduct evaluation question by question in some sections. For example, search section includes six questions which are related to same functions of the website. It is easier to answer all these questions at once for one website.

After all sections completed, each section's average score was calculated for 33 websites. In addition, results were summed for each website to find the overall website score.

During the evaluation, some software automated tools were used to facilitate the assessment and to enhance the accuracy. These tools are described as follows:

- **Sort Site:** It is a website testing tool that checks any website for broken links, spelling errors, usability**,** compatibility, accessibility, compliance search engine optimization and web standards. The software produces a detailed report of the results (displayed in the Figure 3-1). This tool is used in accessibility, page layout, and navigation evaluation of this study.

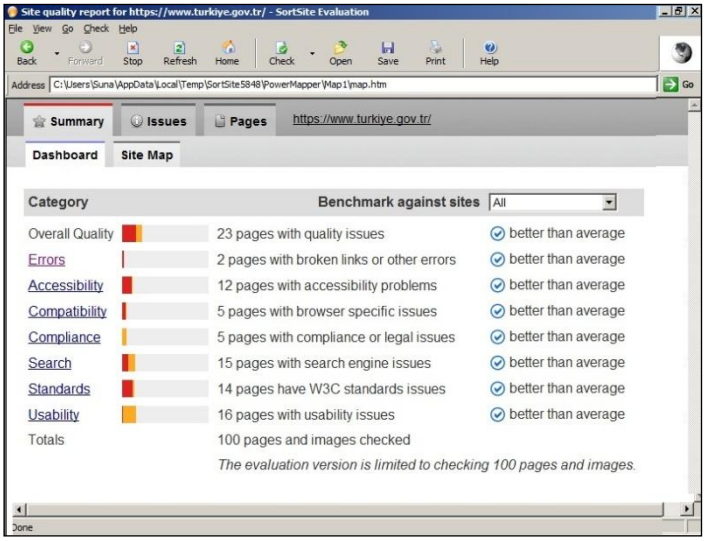


Figure 3- 1 Sort Site Website Evaluation Report

- **ACHECKER:** It is an accessibility evaluation tool that was developed in 2009 by the Inclusive Design Research Centre of the University of Toronto. Using this tool, users can submit a web page via its URL or by uploading its HTML file and can subsequently select with which guidelines to evaluate it, namely the HTML Validator, WCAG 1.0 and WCAG 2.0 (http://achecker.ca/checker). This tool is used in accessibility evaluation of this study.

- **WAVE - Website Accessibility Versatile Evaluator:** WAVE is web accessibility evaluation tool to aid humans in the web accessibility evaluation process. Rather than providing a technical report, WAVE shows the original webpage with embedded icons and indicators that reveals the accessibility information within in the page (http://wave.webaim.org). This tool is used in accessibility evaluation of this study.

- **Accessibility Valet:** This tool checks websites according to Section 508 and W3C Web Content Accessibility Guidelines (WCAG) accessibility compliance. It is a web-based evaluation tool. Any accessibility warnings are shown in a generated report (http://valet.webthing.com/access/url.html). This tool is used in accessibility evaluation of this study.

- **Check My Colors:** It is used for checking foreground and background color combinations of all elements in the website. It provides a report whether the website provides sufficient contrast when viewed by color-blind people. All the tests are based on the algorithms suggested by the World Wide Web Consortium (W3C) (http://www.checkmycolours.com). This tool is used in text appearance evaluation of this study.

- **Color Filter:** This tool shows the website from a color-blind person view. It makes a test for different filters such as protanopia (red/green color blindness, no red cones), deutanopia (red/green color blindness, no green cones) and tritanopia (blue/yellow color blindness, no blue cones) disabilities. This tool is used in text appearance evaluation of this study (http://colorfilter.wickline.org).

- **Windows Eyes:** It is a screen-reader tool that is prepared for visually impaired people. This tool is used in text appearance evaluation of this study

3.2.2 Data Collection with Questionnaire

The questionnaire is prepared to conduct as an interview with the IT department of the selected e-government agencies. The interviews were conducted with eight government institutions. Government agencies were selected according to citizens' usage rate of the website and offered e-government services. The interviewed institutions are:

- E-government Gateway
- Ministry of Justice
- Republic of Turkey Ministry of Customs and Trade
- Turkey Labor Agency
- Republic of Turkey Ministry of National Education
- Turkish Republic Social Security Institute
- Turkish Republic Transmission, Marine and Communication Ministry
- General Directorate of Land Registry and Cadastre

Before the interview, the related Government Institution personnel were informed about the thesis aim and scope of the questionnaire. Also, questionnaire was sent to some interviewers before the meeting.

At the beginning of the interview, IT personnel were informed about the purpose of the study again and the terms usability, accessibility and user-centeredness were defined. Then, questions were asked one by one with giving extra explanation. According to applicability of responses, more detailed questions were asked to the interviewer.

It was wanted to use voice recording device during the interview, but agencies did not allow to use these kind of devices.. For this reason, interview results were collected by taking notes.

3.2.3 Data Analysis Method of Website Evaluation Results

Data analysis was performed according to the sections of website evaluation tools. For each section, 33 websites scores were presented as a graph. Moreover, the encountered problems were described.

In addition, the averages of 33 websites evaluation results were also given. The overall performances of each websites were categorized in four groups, these are:

- Score more than 80,
- Score between 75 - 80,
- Score between 70 - 75, and
- Score between 60 -70.

The common features and problems were explained for each group. In addition to this, each website performance was shown as a graph in Appendix B.

3.2.4 Data Analysis Method of Interview Results

Interview data was evaluated according to sections of the questionnaire; these sections were functional evaluation, usability evaluation, accessibility evaluation and

general findings. In each section, eight Institutions interview findings were presented questions by questions.

In addition, the questionnaire and website evaluation results were synthesis. The common findings were presented.

3.3 Reliability and Validity

In order to make valid evaluation, special automated software tools were used such as Sort Site, Check My Color, Color Filter and etc. For example, the question “Is website prepared in accordance with the W3C priority 1" was scored according to these kind of software tools results. In order to provide accurate results, four tools were used to decide the score of the website. These tools and results are displayed in the Table 4-1.

To conduct reliable study, some techniques were used. First of all, websites were evaluated section by section. The same circumstances were scored the same results. Also, there were some controlling questions in the tool. Similar questions occurred in the different sections. At the end of the evaluations, it was seen that that almost the same scores were given the similar questions.

In addition, three websites were evaluated two times by the same evaluator. Results were compared; 90 % percent answers were the same.

The last study for the reliability is that one website was evaluated from the two different people, both of them from Information System domains. Before the study, they were informed about the purpose of the thesis and evaluation instruments in details. Moreover, examples were shown about how to conduct the website evaluation. They were also informed about the some automation tools which were beneficial to conduct evaluation. The same website was given for them, and then evaluation results were compared. The three results were displayed according to each section in the Table 3-4. There were not significant differences between the results, except for the Website Content Archiving section.

Pearson's Correlation Coefficient statistical technique was used to determine linear relationship between researcher's results and the evaluators' results. This calculation produces result between 0 and 1. The value 0 means that two evaluated samples are not related, 1 means that there is a positive relationship, in other words, two sample results are similar. Our study results are given as follows:

- Researcher and 1st Evaluator correlation value is 0,51
- Researcher and 2nd evaluator correlation value is 0,53

According to these results, there is a positive relationship between Researcher and two Evaluators results. There is not a significant reliability problem.

Table 3- 4 Reliability Analysis Study

Categories	Researcher	1st Evaluator	2nd Evaluator
Section 1 Accessibility	63	84	60
Section 2 Software and Hardware	90	100	75
Section 3 Usage Improvement	83	80	85
Section 4 Homepage	75	87	83
Section 5 Page Layout	86	88	90
Section 6 Navigation	68	92	83
Section 7 Scrollbar and Inside Page Navigation	66	100	77
Section 8 Inside Page Titles and Website Titles	100	100	93
Section 9 Links	70	57	81
Section 10 Text Appearance	66	75	72
Section 11 Data Inputs - Display-Based Controls	64	72	73
Section 12 Image and Multimedia Elements	70	70	72
Section 13 Search	83	90	81
Section 14 Contact	66	95	70
Section 15 Metadata	100	70	90
Section 16 Website Content Archiving	0	50	75
Section 17 Personal Information Privacy and Security	100	90	90
Section 18 Publication of Website	83	63	75
Average:	**74**	**81**	**79**

3.4 Limitations:

1. This study consists of two sections; one is user-centered evaluation tool, the other one is questionnaire. It is a comprehensive study in terms of the evaluated website numbers. However, the questionnaire cannot be conducted for enough number of government institutions. The reasons of this situation are described in section 4-3.

2. The study mainly conducted by one user, increasing the number of evaluators will provide better results.

3. The study uses software tools for some items in the evaluation instrument, the software limitations are also the limitation of this thesis.

CHAPTER – 4

RESULTS

In this section, the results of the thesis are reported in order to evaluate the performance of the e-government websites. As mentioned before, two data collection methods are taken into consideration in this study. One is website evaluation tool, the other one is questionnaire. Website evaluation results are explained in detail in accordance with the sections, and then 33 evaluated websites' results are given. The other tool - questionnaire results are given according to four questionnaire sections which are functionality, usability, accessibility and general questions. Finally, the questionnaire and evaluation results synthesis is presented.

4.1 Website Evaluation

In this section, results of the study are presented in two ways; section based evaluation and website based overall evaluation.

4.1.1 Section Based Evaluation

The website evaluation study consists of 18 sections. Results of each section and results' interpretation are given through the 4.1.1.1 to 4.1.1.18 parts.

4.1.1.1 Accessibility

Accessibility is an important issue of this study, since there are 8.431.937 disabled people in Turkey (National Statistic Institute, 2002). All of these people have right to access e-government services. However, great number of disabled citizens have subjected to many difficulties to use e-government services because of poor designed websites regarding accessibility. This study also confirms this situation showing that 33 websites accessibility evaluation results average is 60,5 over 100.

The website based accessibility evaluation results are shown in Figure 4-3. Turkey E-Government Gateway, Social Security Institute, Ministry of Foreign Affairs and Ministry of Culture and Tourism websites accessibility results are over 70 %, since designers of these websites consider disabled users' needs. For example, Social Security Institute provides alternative webpage for visually impaired citizens (Figure 4-1)

Figure 4- 1 Alternative page design example for disabled citizens

In these four websites, form designs are appropriate, proper directions are given to users, shortcut keys are allowed to be used. Moreover, these websites are capable of

working with screen reader programs efficiently. As an instance, when Turkey E-government Gateway website is used with screen reader program, the shortcut key explanations are provided to users. On the other hand, remaining websites have many accessibility problems which are explained in detail as follows.

A comprehensive study was performed to assess accessibility of websites. Web Content Accessibility Guidelines (WCAG) W3C Priority 1 recommendations are covered. It was found that only two websites fulfill the WCAG W3C priority 1 accessibility requirements, these websites are E-Government Gateway and Presidency of the Republic of Turkey. This evaluation was conducted with the help of accessibility evaluation software tools (Sortsite, Valet, A-Checker, Wave tools that are explained in section 3.2.1). Sortsite and Valet software present results as a pass or fail where the other tools give the total number of errors. This study decides the answer of the "Does website satisfy W3C priority 1 requirements?" questions taking into account the averages of the results obtained using predefined tools, which are shown Table 4-1.

Table 4- 1 W3C Priority 1 accessibility evaluation result

Institute Name	SORTSITE	VALET	ACHECKER	WAVE
	Pass (P) Fail (F)	Pass (P) Fail (F)	Accessibility Error Numbers	Accessibility Error Numbers
Turkey E-Government Gateway	P	P	1	2
Ministry of Justice	F	F	13	11
Prime Ministry of Turkey	P	P	6	1
Ministry of Science, Industry and Tech.	F	F	31	21
Presidency of the Republic of Turkey	F	F	4	8
Ministry of Labor and Social Security	F	F	47	50
Ministry of Environment and Urbanism	F	F	8	6
Undersecretariat of Maritime	F	F	50	49
Government Achieves	F	F	6	8
State Personnel Presidency	F	F	29	53
Ministry of Foreign Affairs	F	F	9	11
Presidency of Religious Affairs	F	F	23	18
Ministry of Economy	F	F	56	51
Turkish National Police	F	F	24	26
Revenue Administration	F	F	23	46
Min. of Food, Agriculture & Stockbreeding	F	F	17	31
Ministry of Customs and Trade	F	F	11	26
Undersecretariat of Treasury	F	F	99	90
Ministry of Interior	F	F	41	42
Ministry of Development	F	F	43	41
Ministry of Culture and Tourism	F	P	10	5
Ministry of Finance	F	F	28	32
Ministry of National Education	F	F	23	39
Ministry of National Defense	F	F	23	23
Ministry of Forestry and Water Affairs	F	F	24	37
Ministry of Health	F	F	25	10
Social Security Institute	F	F	21	16
Gen. Dir. of Land Registry and Cadastre	F	F	8	10
Grand National Assembly of Turkey	F	F	8	9
Turkish Statistic Institute	F	F	41	24
Min. of Transmission, Marine & Comm.	F	P	1	2
Turkey Labor Agency	F	P	14	10
Meteorology General Directorate	F	F	10	16

The main problem of these 33 websites is related to page view, since the font size is not big enough to see. For instance, "Tahoma - 7,5" font size is used in E-Government webpage for the navigation text which is very difficult for people who have sight problems. Moreover, some websites do not use appropriate color contrast. One of the bad example is light blue background and light grey foreground color combination which result in unreadable text for many users. Also, color-blind people face with difficulties in websites which prefer using red-green color combinations.

The other problematic issue is that most of the websites do not provide text alternatives for any non-text content. For instance, Presidency of the Republic of Turkey website serves some videos for the news and announcement, but the website does not provide a detailed explanation of the video content in a text format. Therefore, hearing impaired people cannot use these services. Also, people who do not have appropriate browser extensions cannot see the video content. In addition, alt text tag is not used for all images in many websites. Preparation of non-color alternatives for the websites will be helpful in facilitating the life for color blind people. . However, 26 websites failed to provide this features like Ministry of Interior displayed in Figure 4-2. This report was obtained from WAVE accessibility checker program. The  icon represents that no alt-text tag usage for non text items. As displayed in the Figure 4-2, Ministry of Interior website did not use alt text tags.

Figure 4- 2 Alt-text usage in websites

In order to access website contents, disabled people use some auxiliary tools such as screen reader programs, but results show that 16 e-government websites are not readable by screen reader programs such as Ministry of Justice, Presidency of the Republic of Turkey, Ministry of Science, Industry and Technology, Ministry of Labor and Social Security and Prime Ministry of Turkey. This problem arises from the scripts and applets used in websites, since screen readers cannot read the scripts and applets.

Form usage is another problem for disabled people. Forms must be prepared carefully to be accessible for everyone including explanatory information for the data input field. The results show that all of the evaluated websites contain explanatory labels for each data input fields. Also, in the evaluated 33 websites, users can navigate into the forms with use of tab key, but the cursor does not appear in the first data input field.

In addition, websites must guide users in case of an error. For example, when the form is submitted by users, some of the websites do not provide any status information about the success or fail of the submission, these websites are Revenue Administration, Undersecretariat of Treasury, General Directorate of Land Registry and Cadastre, Grand National Assembly of Turkey and Ministry of Transmission, Marine & Communication.

Besides form structure, the captcha property is used in websites where 13 of them do not have audio option to pass captcha. For this reason, disabled people are faced with an important problem; they cannot login to the website to conduct desired processes. These websites are:

- Prime Ministry of Turkey
- Ministry of Science, Industry and Technology
- Presidency of the Republic of Turkey
- Presidency of Religious Affairs
- Ministry of Economy
- Ministry of Agriculture & Stockbreeding
- Ministry of Culture and Tourism
- Ministry of National Education
- Ministry of Forestry and Water Affairs
- Ministry of Health
- General Directorate of Land Registry and Cadastre
- Turkey Labor Agency
- Meteorology General Directorate

CSS validation is less problematic. All websites which used style sheets are mainly compliant with the alternative browsers. Moreover, 19 of the evaluated websites work in the mobile browsers properly where the remaining ones have some problematic page view in mobile browsers.

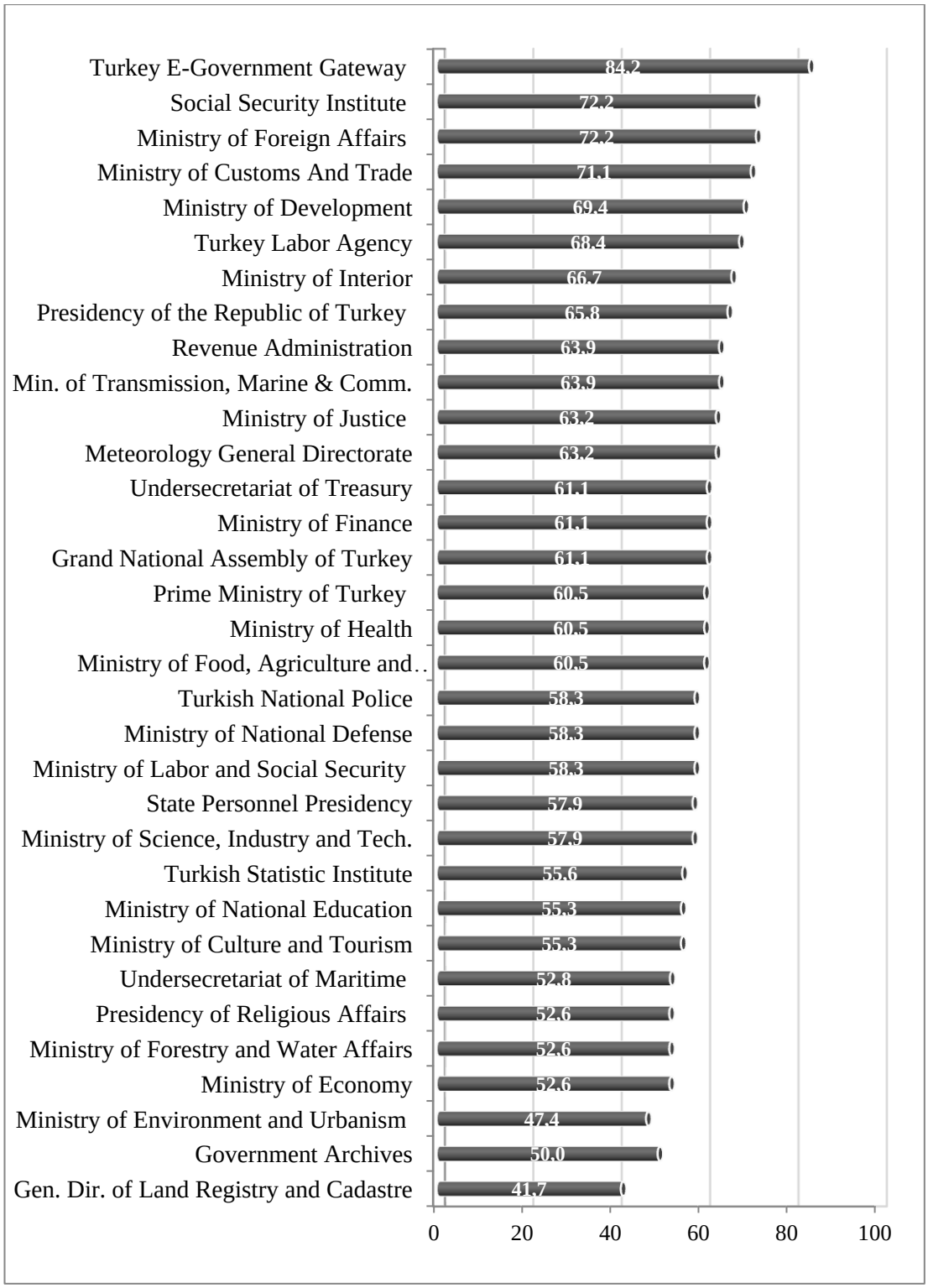


Figure 4- 3 Accessibility section results

4.1.1.2 Software and Hardware

The technological infrastructure of the Turkey has been developing rapidly. The internet speed has increased. Faster and more functional computers are produced. All these developments decrease the problems related to accessing e-government services. However, citizens still have difficulties due to their software and hardware infrastructure. Therefore, the designers must take into account these features. The website evaluation results show that many designers consider these issues, the average result of the 33 websites is 91% and the individual results of the websites are presented in Figure 4-4. The results show that most of evaluated websites satisfy the below listed requirements.

- Working with current operating systems,
- Working with different browsers,
- Working without installing additional applications,
- Working with different internet speed,
- Working with different screen resolution.

Few websites have some problems related with software and hardware issues. For instance, loading time of Government Achieves and Turkish National Police websites are long due to the usage of big sizes videos, animations or pictures. Users with low internet speed are subject to problems to access services in these websites.

Browser compatibility is another problem of some websites such as Government Archives and Undersecretariat of Maritime. The browser compatibility is tested with SORTSITE website evaluation tool with different version of browsers which are shown in Table 4-2. For instance, according to evaluation results, Government Archives website does not compatible with Internet Explorer version 8.0 and 9.0, Firefox version 2.0, 3.0, 3.6 , Safari 5.0 and iPhone browsers.

Table 4- 2 Using browsers for website evaluation

Browser	Internet Explorer				Firefox			Safari	Opera	Chrome	iPhone	Android
Version	6.0	7.0	8.0	9.0	3.6	7.0	8.0	5.0	11.0	16.0	4.0	3.0

Another problematic issue is screen resolution. Citizens use different resolution values, the e-government websites must display each screen resolution properly. Ministry of Customs and Trade, Ministry of Development websites do not look same in different resolutions, also horizontal and vertical scrollbar appear due to resolution changes which result in difficulty in website usage.

Figure 4- 4 Software and Hardware section results

4.1.1.3 Usage Improvement

In order to increase the benefit of e-government applications, every website must be designed in an usable manner. This section generally evaluates the e-government websites according to these aspects. Results for each of the evaluated websites are given in Figure 4-10. The overall performance of the 33 websites is 84 % which can be considered as well but there are some critical problems which are described as below.

The main problem is related with the organization of the contents, since the content hierarchy is complex in some websites. 17 websites have organization problems, some of these websites are Ministry of Labor and Social Security, Undersecretariat of Maritime, Government Achieves, State Personnel Presidency, Ministry of Economy, Turkish National Police, Revenue Administration, Ministry of Food, Agriculture & Stockbreeding, General Directorate of Land Registry and Cadastre, Grand National Assembly of Turkey, Ministry of Culture and Tourism and Meteorology General Directorate.

One of the website content hierarchy problem is related with menu organization. For instance, Ministry of Development website's menus contain too many items, and these items are not arranged according to importance or usage frequency. Therefore, it is difficult to find desired information from the menu (Figure 4-5).

Figure 4- 5 Wrong menu organization example

Moreover, the main page organization is changing while navigating to other pages in the website and the menus are not constant. For this reason, users can lost in the website. They must navigate the main menu to switch within the pages in the website. For example, Ministry of Labor and Social Security website has quick access navigations that are located in the homepage (Figure 4-6). These navigations do not appear in the main menu of the websites. Therefore, users can not access these links from other pages of the websites.

Figure 4- 6 Grouping navigation items example - 1

A similar situation exists in the Ministry of Culture and Tourism website. The navigations are presented in two groups (Figure 4-7). When users navigate to another page from the home page, the right navigation group disappears. The menus are not consistent.

Figure 4- 7 Grouping navigation items example - 2

Images are used in websites to clarify its content. According to study results, few websites use unrelated images that do not support the text in the website. For instance, Ministry of Customs and Trade website uses a big picture at the center of the homepage (Figure 4-8), but the provided service and picture are irrelevant.

Figure 4- 8 Improper Image Usage example

In addition, the website content must be clear for all citizens. Any technical terms, abbreviation or foreign words must be explained. The results show that few of the websites have some problems in this issue; they contain some undefined technical words and abbreviations. These websites are Ministry of Customs and Trade, Ministry of Justice, Ministry of Foreign Affairs and Presidency of Religious Affairs.

Many websites provide downloadable information in different file format (pdf, doc, ppt, xsl, gif and etc). It is expected to name the files appropriately. The file is named with lower case with no space character. However, during the website evaluation, it was found that some of the file names consist of meaningless numbers and characters such as 1782685315583655230.doc. Ministry of Food, Agriculture & Stockbreeding and Ministry of Development websites have this problem.

To improve usage, addition of a help section is important, five of 33 evaluated websites do not have help section, and these websites are:

- Prime Ministry of Turkey,
- Ministry of Science, Industry and Technology,
- Ministry of Customs and Trade,
- Undersecretariat of Treasury, and
- Social Security Institute.

Content quality of the help section is also an important issue. E-government gateway website is a good example for the content of the help. As shown in Figure 4-9, the website provides below services for users:

- Quick Help,
- General Help,
- Provide information about services,
- Useful information, and
- Call center.

Figure 4- 9 Providing help in the website

Figure 4- 10 Usage improvement section results

4.1.1.4 Homepage

A well-designed home page creates a positive impression on users. Homepage is a key element, since it presents the main features of the websites. An exhaustive study was conducted on the homepages of websites examining the existence of Institute logo, contact information, site map, search options and website aim. Results are represented in the Figure 4-11. The overall evaluation result of the 33 websites is 73,7. Presidency of Religious Affairs website satisfies all these requirements. On the other hand, Ministry of Finance website cannot fulfill many requirements of Homepage evaluation. Remaining evaluation results are detailed as bellow:

- **Homepage links in the page:** The user can reach the main page from other pages. However, Ministry of Justice and Ministry of Finance websites do not provide this feature. In these websites, all links open in new pages. Although users do not leave the homepage, new pages make the navigation difficult for users.
- **Presence of Government Agency's logo:** Ministry of Finance and Ministry of Customs and Trade websites do not use the institute logo in their website.

- **Presence of contact information:** Ministry of Finance websites does not contain contact information in the main page.

- **Presence of sitemap:** Seven of the evaluated websites do not contain sitemap which is an important feature that eases to find information in the websites. These websites are; Prime Ministry of Turkey, Government Achieves, State Personnel Presidency, Ministry of Foreign Affairs, Ministry of Food, Agriculture and Stockbreeding and Ministry of National Education.

- **Presence of search options:** Although, search options are important and most of the users prefer to find the desired information via using search functions, four of the evaluated websites do not contain this feature. These websites are;
    - Government Achieves,

- Ministry of Finance,
- Ministry of National Defense, and
- Grand National Assembly of Turkey.

- **Presence of website aim:** Most of the evaluated websites do not explain the general purpose and services of the website. Only three websites explain the general purpose and the services of their websites, these websites are; Turkey E-Government Gateway, Presidency of Religious Affairs and Turkey Labor Agency.

- **A full page view:** It is preferred to use a homepage that can be seen in a single page which allows the whole content to be displayed without scrolling. The evaluation was conducted with using 1024 x 768 screen resolutions. The result shows that, 23 of the evaluated homepages are not seen in a single page, the vertical scrollbar exist. The remaining 10 websites are seen in a single page (no scroll usage). These websites are:
  - Ministry of Justice,
  - Prime Ministry of Turkey,
  - Ministry of Science, Industry and Technology,
  - Ministry of Labor and Social Security,
  - Presidency of Religious Affairs,
  - Ministry of Culture and Tourism,
  - Ministry of National Defense,
  - Social Security Institute,
  - General Directorate of Land Registry and Cadastre, and
  - Grand National Assembly of Turkey.

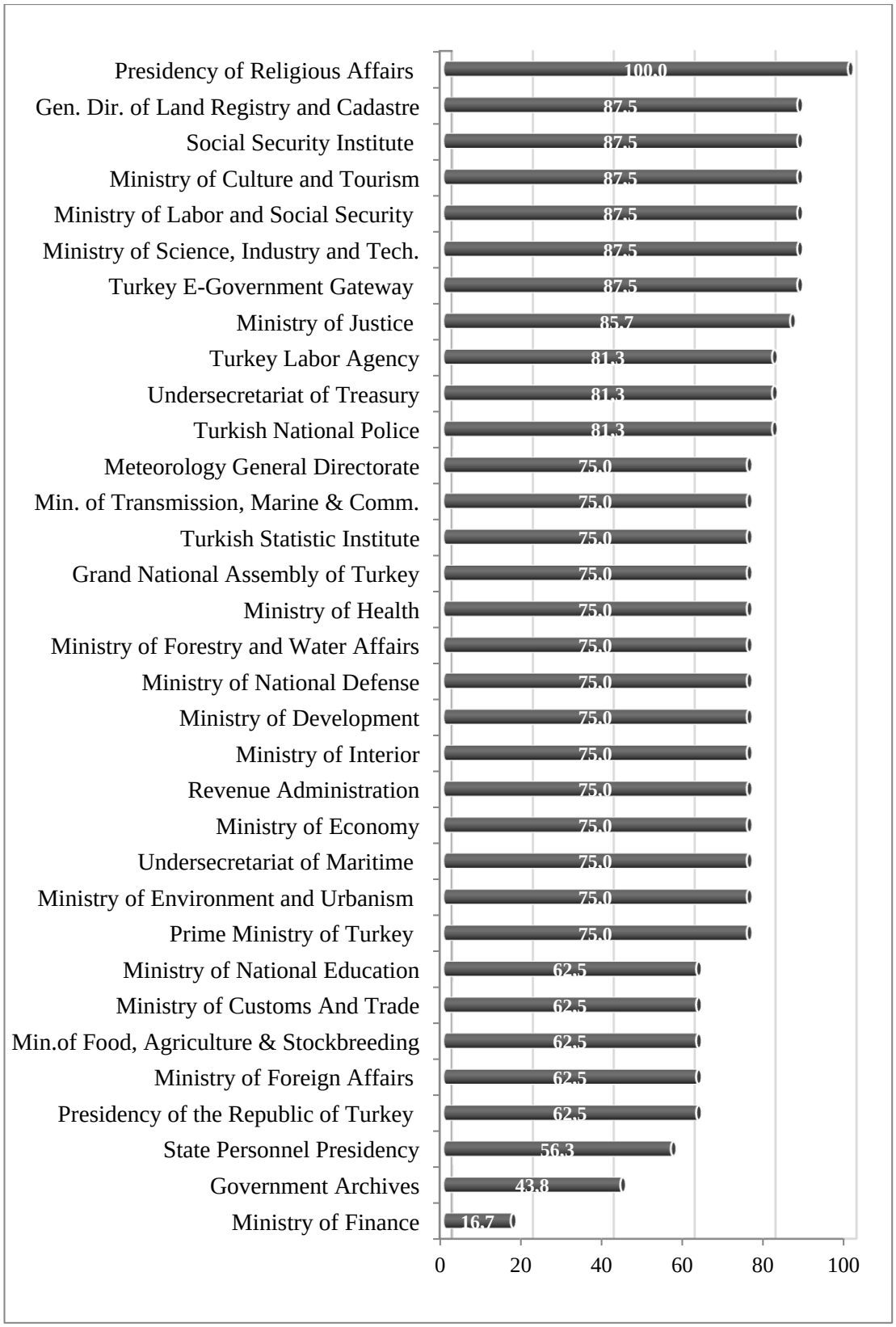


Figure 4- 11 Homepage section results

4.1.1.5 Page Layout

This section evaluates the websites in terms of format and content. Results for each of the evaluated websites are given in the Figure 4-13. The overall performance of the 33 website is 79 %. The problems encountered during the study are listed as below.

The hierarchies of the websites content were examined. It was found out that few websites do not locate the important information in the top site of the website such as Revenue Administration. Figure 4-12 displays the homepage of Revenue Administration website. Internet tax service is the crucial application of this Agency, but it was not located at a prominent place on the website. Also, the news area is too long in the webpage which result with a limited area at the end of the page for the announcement section.

Figure 4- 12 Prioritizing information in the website

Moreover, the website format features were evaluated, seven of the websites do not use space to separate the paragraphs which makes it difficult to read for users. These websites are listed as bellow:

- Ministry of Justice
- Prime Ministry of Turkey
- Ministry of Science, Industry and Technology
- Ministry of Labor and Social Security
- Ministry of Food, Agriculture & Stockbreeding
- Ministry of Finance
- Turkish Statistic Institute.

The font type and font size consistency were also investigated. 15 of the evaluated websites do not use consistent font type and font size. For instance, Verdana, Arial, Calibri font types are used with four different font sizes in Undersecretariat of Maritime website. The remaining problematic websites on this issue are; Turkey E-Government Gateway, Presidency of the Republic of Turkey, Government Achieves, State Personnel Presidency, Presidency of Religious Affairs, Ministry of Economy, Prime Ministry of Turkey, Ministry of Customs and Trade, Ministry of Development, Ministry of Forestry and Water Affairs, Ministry of Transmission, Marine and Communication, Turkey Labor Agency and Meteorology General Directorate.

The length of the line must be appropriate to facilitate reading; 75-100 character is suitable for one line according to the study of Türksat (2009). Three of the evaluated websites contain more than 75 characters in one line; these websites are Government Achieves, Ministry of Interior and Social Security Institute.

The language options of the websites were also studied in this section. Some of the government agencies required to present different language options according to their target audience. But, the results show that few e-government websites have alternative language options such as Ministry of Foreign Affairs and Presidency of the Republic of Turkey.

When new information added into a website, some labels are used to help users to follow the website contents such as "new", the "latest additions" and "last updated". 17 of the evaluated websites did not specify these kinds of labels, some of these websites are: Ministry of Science, Industry and Technology, Ministry of Environment and Urbanism, Undersecretariat of Maritime, State Personnel Presidency, Ministry of Customs and Trade, Undersecretariat of Treasury and Ministry of Interior.

As a government Institute, it is expected to avoid some commercial connection. But, Meteorology General Directorate website presents commercial advertisements of the private companies.

Moreover, websites should state a copyright notice to protect their contents, but 14 of the evaluated websites do not contain copyright statement to protect content pursuant to law, some of these websites listed as bellow:

- Ministry of Finance,
- Ministry of National Education,
- Gen. Directorate of Land Registry and Cadastre,
- Grand National Assembly of Turkey,
- Ministry of Interior,
- State Personnel Presidency,
- Ministry of Foreign Affairs,
- Presidency of Religious Affairs,
- Presidency of the Republic of Turkey, and
- Ministry of Labor and Social Security.

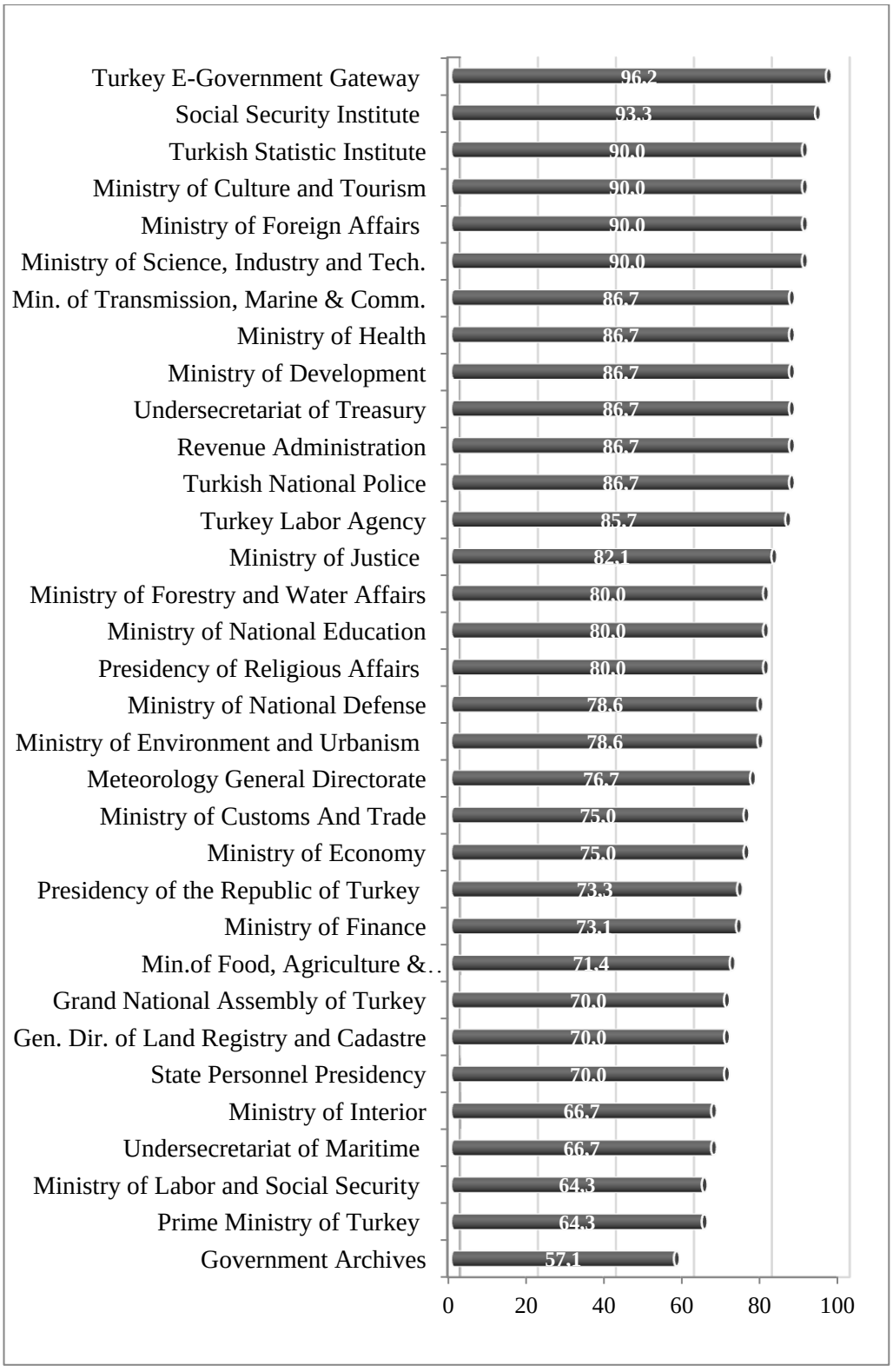


Figure 4- 13 Page Layout section results

4.1.1.6 Navigation

This section evaluates website navigation structures. Results for each of the evaluated websites are given in the Figure 4-14. The overall performance of the 33 websites is 78,9 %. Navigation structures of the websites were assessed according to following criteria:

- **Grouping of navigation elements:** Four of the websites have problems about this issue; these websites are Revenue Administration, Ministry of Development, Ministry of Transmission, Marine and Communication, and Ministry of Culture and Tourism. Remaining websites group the links in the menus.

- **"Next" and "Previous" buttons:** These buttons are important to navigate in the website easily. However, 24 of the evaluated websites do not include "next" and "previous" button. Users are forced to use buttons in their browsers. On the other hand, Turkey E-Government Gateway, Ministry of Labor and Social Security and Meteorology General Directorate use these buttons effectively.

- **Working of the connections:** Some links are broken in 11 of the evaluated websites. For this reason, users can not access the required information. These websites are;
    - Ministry of Justice,
    - Ministry of Science, Industry and Technology,
    - Ministry of Labor and Social Security,
    - State Personnel Presidency,
    - Ministry of Foreign Affairs,
    - Turkish National Police,
    - Revenue Administration,
    - Ministry of Food, Agriculture and Stockbreeding,
    - Ministry of National Education,
    - Ministry of National Defense, and

- Ministry of Transmission, Marine and Communication.

Moreover, some connections are not reached from the targeted page, another page is opened. Six of the evaluated websites have problems about this issue.

- **Breadcrumb usage:** Most of the e-government websites provide huge contents and services. Users sometimes feel lost in the website. Breadcrumb technique describes where the users are in the website. 19 of the evaluated websites use this technique to facilitate navigation into their website such as Ministry of Environment and Urbanism, Undersecretariat of Maritime, Government Achieves, State Personnel Presidency, Ministry of Foreign Affairs, Presidency of Religious Affairs, Ministry of Economy and Turkish National Police.

- **Sitemap:** This section evaluates the existence of the sitemap (Sitemap feature is also evaluated in the Homepage section). Seven of the evaluated websites do not contain sitemap. These websites are listed as follows:

  - Prime Ministry of Turkey,
  - Government Achieves,
  - State Personnel Presidency,
  - Ministry of Foreign Affairs,
  - Ministry of Food, Agriculture and Stockbreeding,
  - Ministry of Customs and Trade,
  - Ministry of Culture and Tourism, and
  - Ministry of National Education.

Figure 4- 14 Navigation section results

4.1.1.7 Scrollbar and Inside Page Navigation

Government agencies represent a great deal of information in their websites. Content management becomes a critical issue in this kind of websites. They use some techniques to organize websites such as scrollbar, marquee, anchor navigation and etc. This section evaluates the websites in terms of effective usage of these kinds of techniques. Results for each of the evaluated websites are given in the Figure 4-15. The overall performance of the 33 websites is 83 %. The encountered problems are explained in detail as follows.

Using horizontal scrollbar usually makes website usage difficult. Especially, users feel uncomfortable when they subject to use horizontal and vertical scrollbar at the same time. Six of the evaluated websites have problems regarding the horizontal scrollbar usage. These websites are Turkish National Police, Ministry of Customs and Trade, Ministry of Interior, Ministry of Development, Ministry of Finance and Turkey Labor Agency. Moreover, it is seen in the evaluation that few websites use nested vertical scrollbars such as Ministry of National Defense website. There are two vertical scrollbar and users are subject to the handle both of them at the same time which complicates the usage.

It is beneficial to handle very long pages with numbering the web pages. For example, the search results page sometimes includes many items. Instead of serving whole content in one page, numbering the pages and serving the most related information into the first pages make usage easier. Also, it saves users time to find information. 27 of the 33 evaluated websites use page numbering. In addition, 24 of the evaluated websites use marquee technique to present multiple contents in a small area. Most of the evaluated websites use marquee to represent news and announcements.

In order to handle large size contents, almost all of the evaluated websites prefer a downloadable file format for this content.

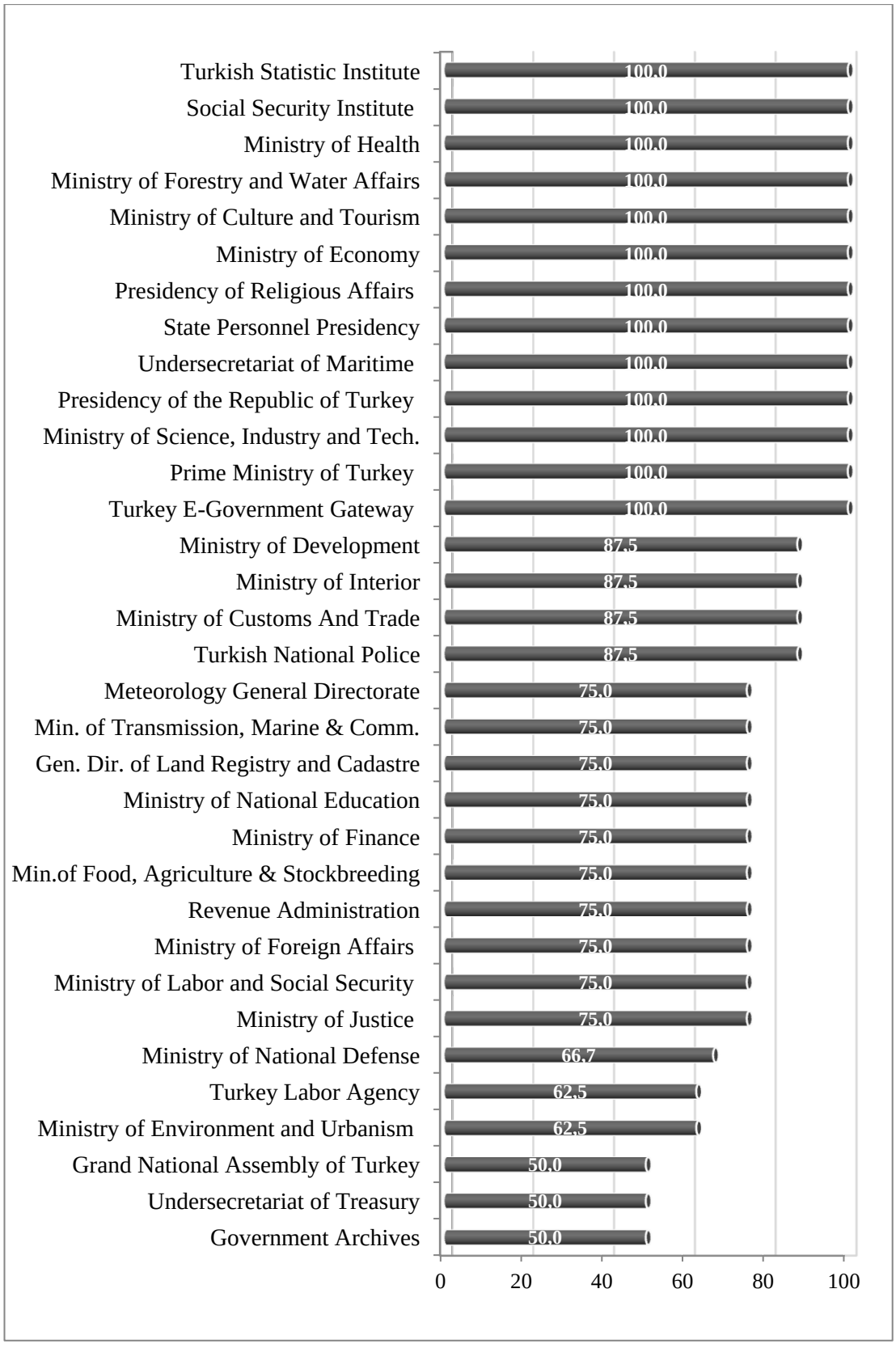


Figure 4- 15 Scrollbar and inside page navigation section results

4.1.1.8 Inside Page Titles and Website Titles

Page title is another item to serve information when users are in the website. The website title is located at the top of the browsers to give general information and inside page title provides information in detail about examined content. Both titles must be clear and understandable. This section evaluates the websites in terms of the existence of the titles and appropriateness of their usage. The results about titles are provided in detail in the Figure 4-16. The average result of the 33 websites about page titles is 72.7 %.

18 of the evaluated websites have problems about titles. For instance, inside page titles are not used in two websites, these are; Ministry of Labor and Social Security and Presidency of Religious Affair. Problems of the remaining 16 websites are related with using same webpage titles for different pages. These websites are listed as bellow:

- Ministry of Labor and Social Security,
- Ministry of Environment and Urbanism,
- Undersecretariat of Maritime,
- Government Achieves,
- State Personnel Presidency,
- Turkish National Police,
- Ministry of Customs and Trade,
- Ministry of Interior,
- Ministry of Culture and Tourism,
- Ministry of National Education,
- Ministry of National Defense,
- Ministry of Health,
- Gen. Directorate of Land Registry and Cadastre,
- Grand National Assembly of Turkey,
- Turkish Statistic Institute, and
- Ministry of Transmission, Marine and Communication.

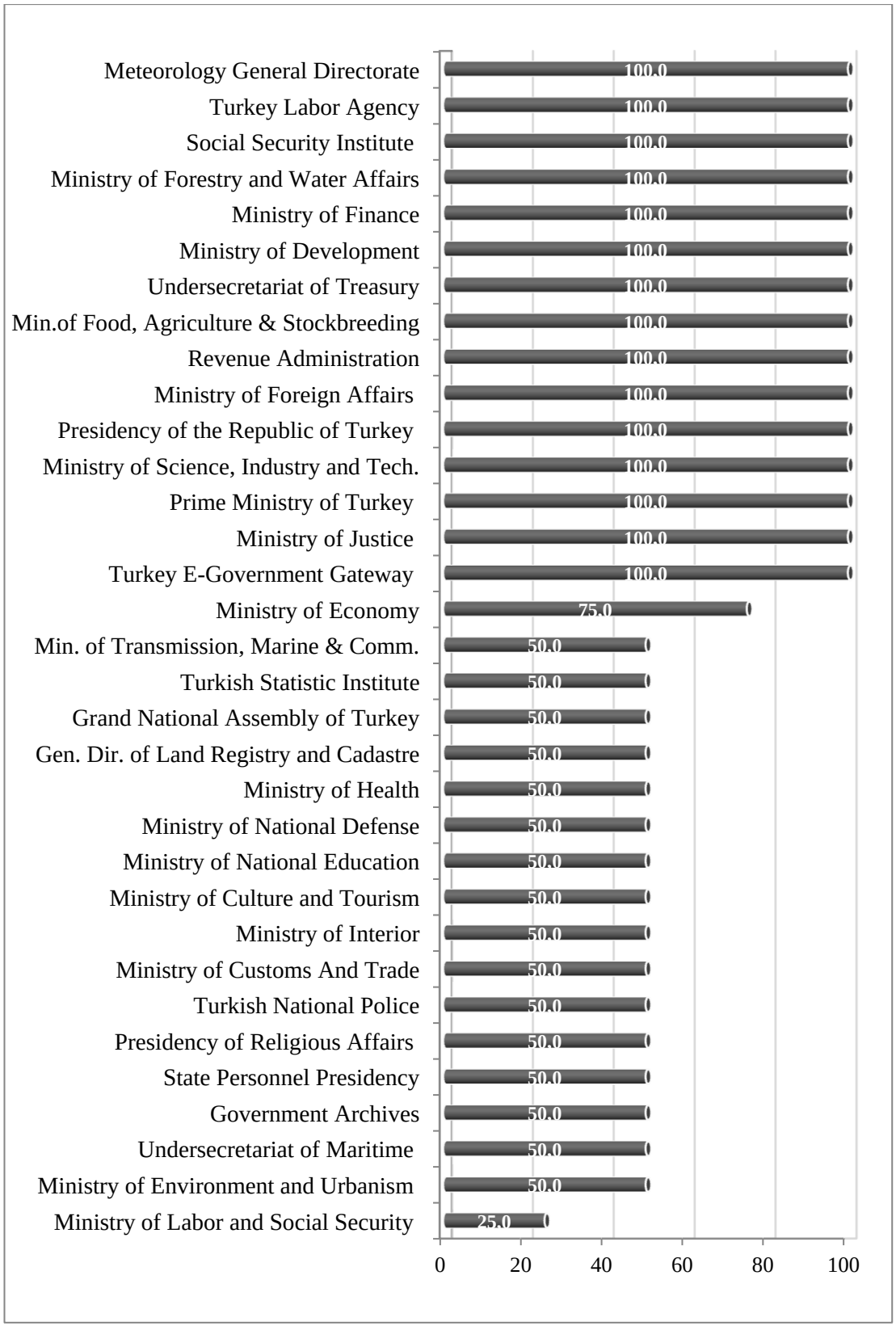


Figure 4- 16 Inside page titles and website titles section results

4.1.1.9 Links

Links provide webpage navigation. In this section, website links structures are evaluated and results are given the Figure 4-17. The average result of this section is 70,5 %. According to this figure, National Statistical Institute has satisfied the most of the requirements of links section. These requirements are:

- Providing additional links for important services,
- Providing additional links to the other websites that are related to website content,
- Using text connections instead of images connections, and
- Changing the visited websites text color.

The first evaluated item for a website is providing alternative links for the important services. Only 16 of the evaluated websites provide more than one links for important items such as Turkey E-Government Gateway, Ministry of Foreign Affairs, Ministry of Finance, Ministry of National Defense and Turkish Statistic Institute websites.

Providing connections to the other relevant websites facilitate finding information. All of the evaluated websites give connection to the other related government websites. When user navigates to these websites, an information must be given such as "You are leaving this page and directing another webpage". Only four of the evaluated websites give these kind of information, these are E-Government Gateway, State Personnel Presidency, Ministry of Food, Agriculture and Stockbreeding and Ministry of Forestry and Water Affairs.

In general, the text is more easily understood as a connection than picture. Also, previous studies show that users are more comfortable to use text links; they have some problems concerning usage of picture links (Türksat, 2009). However, this study reveals that 16 of the websites prefer to use text links. Moreover, it is easier to change visited link colors with usage of text links. Only Undersecretariat of Treasury website takes into consideration this important point.

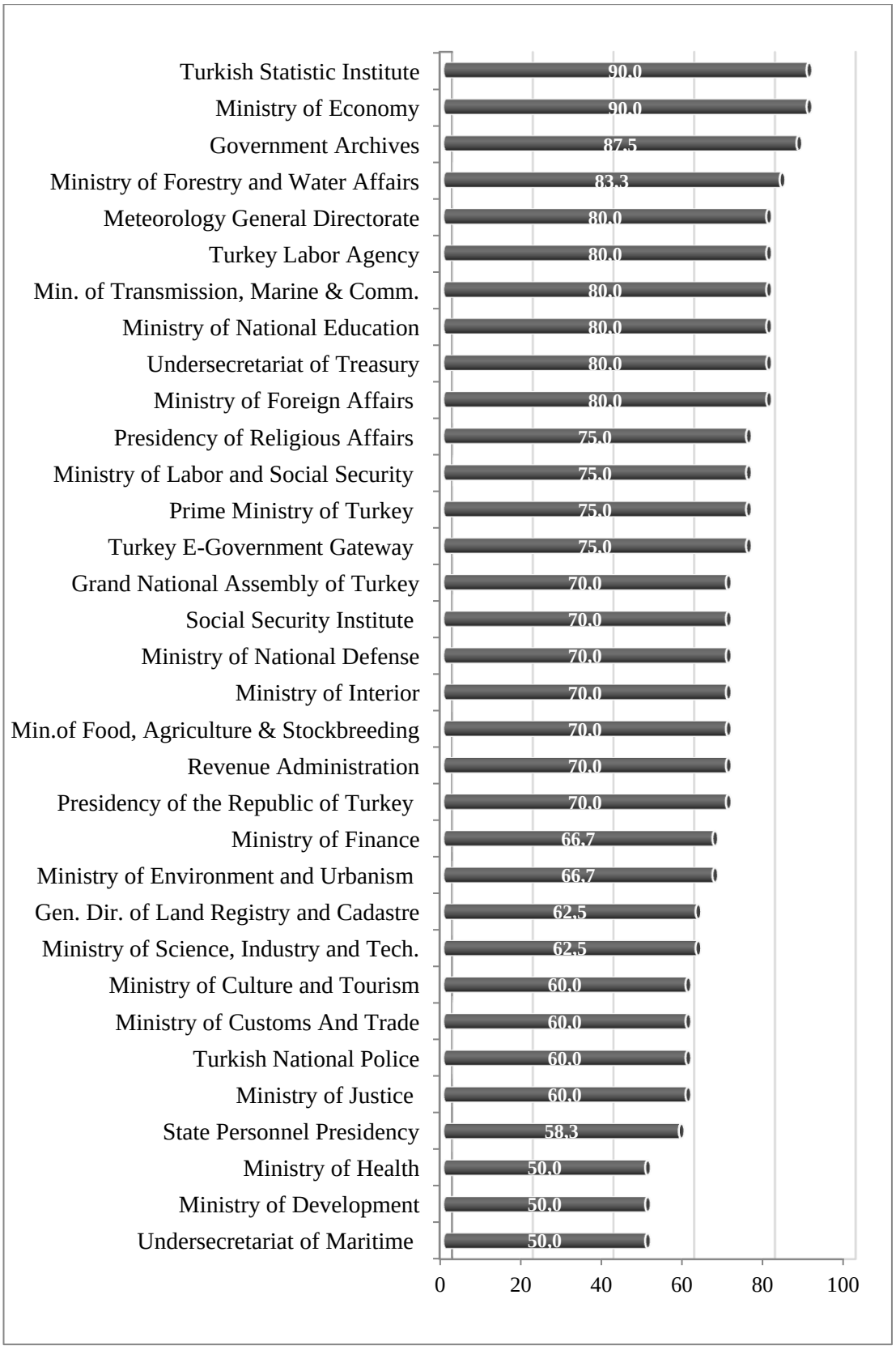


Figure 4- 17 Links section results

4.1.1.10 Text Appearance

This section evaluates the websites in terms of font sizes, font types, color contrasts of background and foreground and etc. The results about text appearance are detailed in Figure 4-19. The average result of the 33 websites about text appearance is 89.6 %. Figure 4-10 shows that 11 websites do not have any text appearance problems. Problems of the remaining websites are detailed as follows:

- **Text readability in different screen resolution:** Four of the evaluated websites (Government Achieves, Turkish Statistic Institute, Turkey Labor Agency, and Meteorology General Directorate) have problems about text appearance in different resolution. The texts are viewed too small to read.

- **Font size:** Similar to screen resolution results, Four of the evaluated websites have smaller font size such as Verdana 6,5**.** These websites are Government Achieves, Turkish Statistic Institute, Turkey Labor Agency, and Meteorology General Directorate. Small font size makes readability difficult. Especially, visually impaired people cannot use this websites easily.

- **Usage of familiar font type:** Fonts that are familiar to the users must be used in order not to decrease users reading speed. Almost all of the evaluated websites use the common font types such as Arial, Times New Roman and Verdana.

- **Color contrast:** Six of the evaluated websites have color contrast problem. These websites are Ministry of Justice, Prime Ministry of Turkey, Ministry of Food, Agriculture and Stockbreeding, State Personnel Presidency, Revenue Administration and Turkey Labor Agency. This issue sometimes creates handicap for the users. For instance, the website of Ministry of Food, Agriculture and Stockbreeding uses light blue background and white foreground color for the navigation elements (Figure 4-18). As a result, the users cannot find the links.

Figure 4- 18 Wrong color contrast example

- **Text appearance consistency:** It is expected from websites to use same font type and font size in different pages. But 17 of the evaluated websites failed to provide text appearance consistency. Some of these websites are Undersecretariat of Maritime, Government Achieves, Presidency of Religious Affairs, Ministry of Economy, Ministry of Customs and Trade and Ministry of Interior.

- **Usage of emphasizing items:** Underlined, bold, italic, shade and uppercase features are expected to be used effectively. Five of the websites do not use these features properly. For instance, in Undersecretariat of Treasury website, almost all texts are written as underlined. The other websites that contain wrong examples are Revenue Administration, Ministry of Customs and Trade, Presidency of the Republic of Turkey and Ministry of Finance.

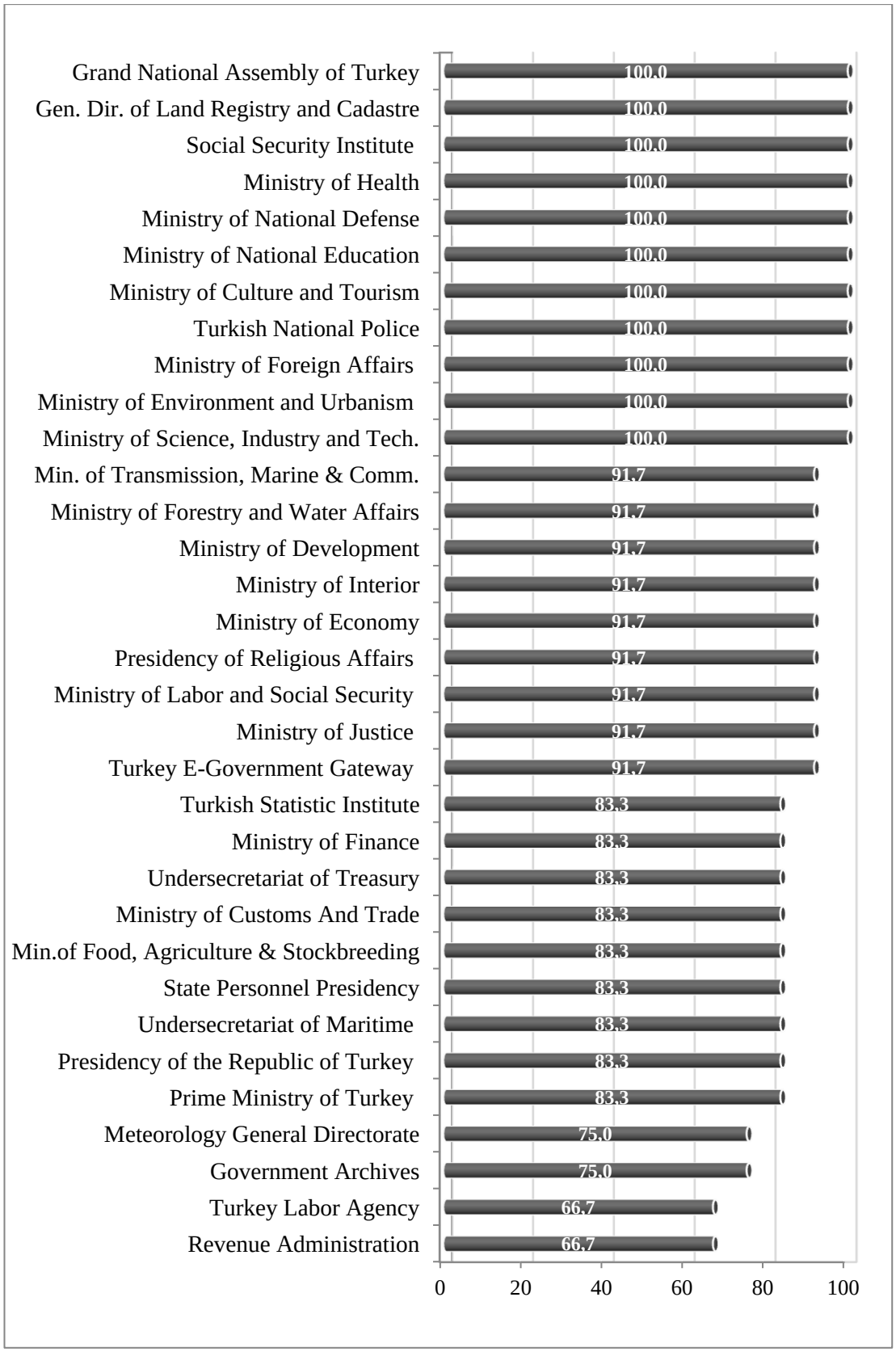


Figure 4- 19 Text appearance section results

4.1.1.11 Data Inputs - Display Based Controls

Display-based controls are required to satisfy user interaction with the websites. Most of the e-government websites use forms and log-in applications that require data input from the users. This section evaluates the websites in terms of effectiveness of the display based controls. The study results are presented in detail in Figure 4-22. The average score of the 33 of the evaluated websites is 77,5 %. According to this result, General Directorate of Land Registry and Cadastre website is one of the poor design example of data input controls. Figure 4-20 show that:

- User can enter the wrong data types in the fields, for instance, non-numeric characters can be written in to the Turkish citizens ID field and the system does not give any error messages.

- Data fields' input character size is not defined.

- Although most of the fields are filled with wrong data, system accepts the application and show the message displayed in Figure 4-21.

The encountered problems for the remaining websites are explained in detail as follows.

Radio buttons and check boxes usages are evaluated. Almost all of the evaluated websites use radio buttons and check boxes appropriately. Labels of the data field must be descriptive. The evaluation result shows that labels are used correctly.

Data input fields must be designed to decrease the user errors. The regulatory input area must be specified. Also, incorrect types of data entrance must be interfered in the websites. For instance, Turkish Citizen's ID field allows 11 numeric characters entrance. According to evaluation results, only 11 of the websites make these type of arrangement, these websites are; Turkey E-Government Gateway, Ministry of Justice, Prime Ministry of Turkey, State Personnel Presidency, Ministry of Foreign Affairs, Ministry of Food, Agriculture and Stockbreeding, Ministry of Culture and

Tourism, Ministry of National Education, Ministry of Forestry and Water Affairs, Ministry of Health and Turkish Statistic Institute.

The feedbacks are important to warn users for incorrect entrance. 18 of the evaluated websites provide proper feedback to the users. Some of these websites are:

- Ministry of Forestry and Water Affairs,
- Ministry of Health,
- Social Security Institute,
- Turkey E-Government Gateway,
- Ministry of Justice,
- Prime Ministry of Turkey,
- Ministry of Science, Industry and Technology,
- Presidency of the Republic of Turkey,
- Ministry of Labor and Social Security, and
- Ministry of Environment and Urbanism.

Sample data representation also facilitates the filling of the forms but 25 of the evaluated websites do not show a sample data. Only six of the pages represent sample data such as Government Achieves and Social Security Institute websites.

When user open the forms, it is beneficial if the cursor appears in the first data entry field. Also, navigating within the fields with the tab key is preferred by most of the users. Both features are examined in the study. Results show that cursor does not appear in the first data entry field in almost all of the websites. But, tab keys are working to switch among the fields.

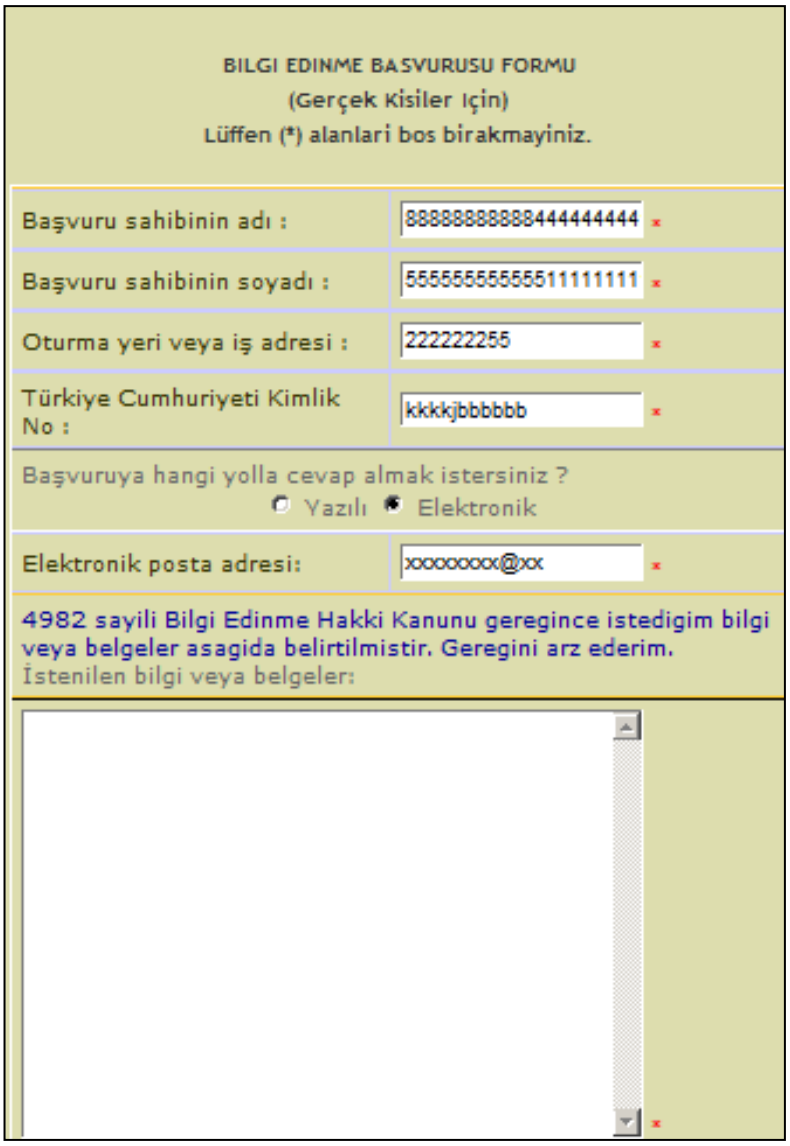


Figure 4- 20 Wrong data input fields design

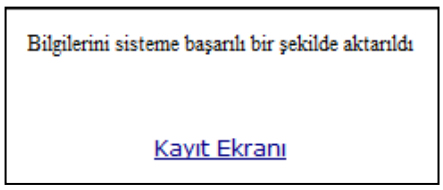


Figure 4- 21 Feedback example

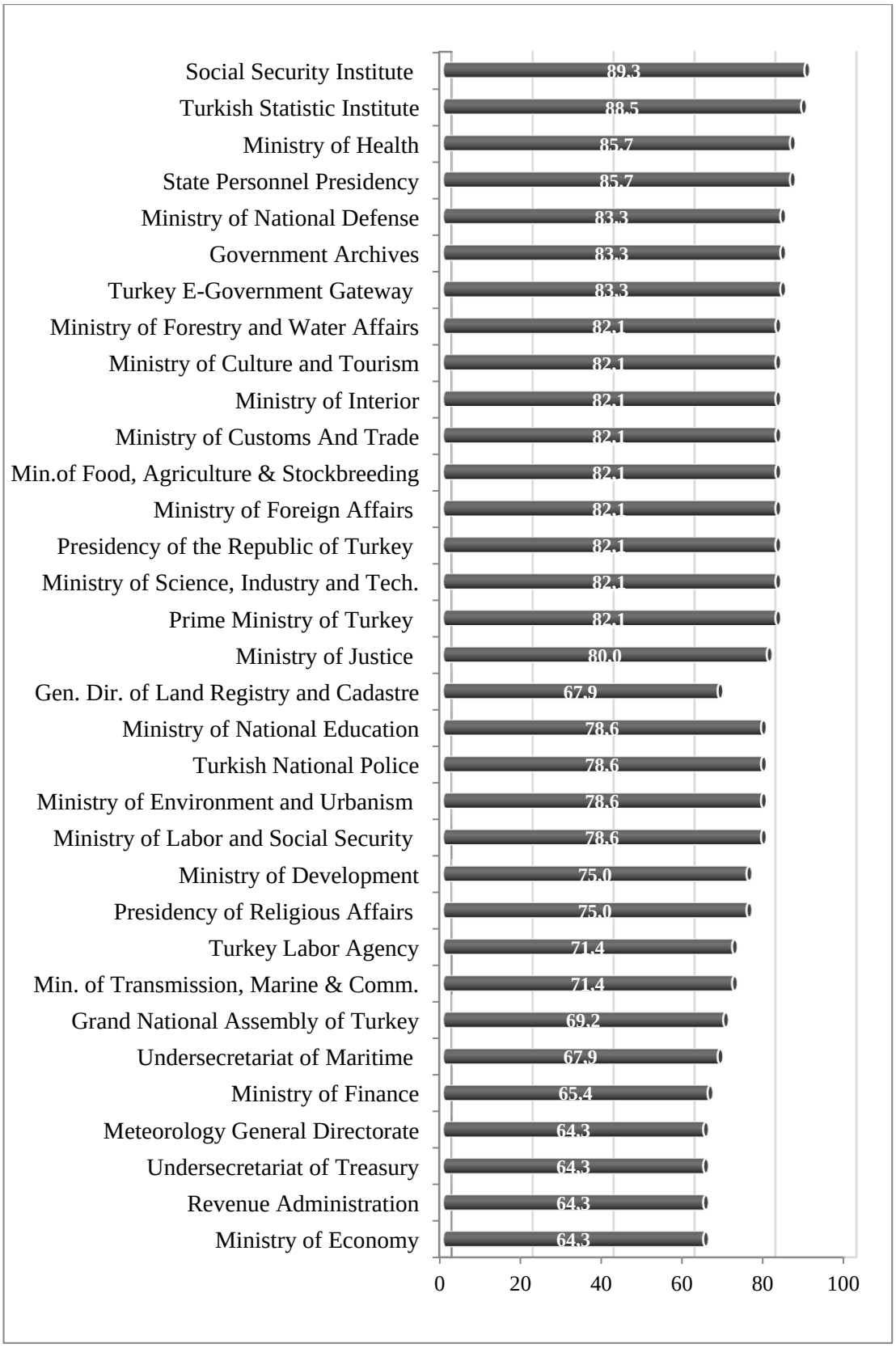


Figure 4- 22 Data inputs - display-based controls section results

4.1.1.12 Image and Multimedia Elements

Images and multimedia elements facilitate learning activity when used correctly. This section evaluates the images and multimedia elements usage of the websites. The study results are displayed in Figure 4-23. The average score of this section is 80,7 %.

Evaluated websites have some problems regarding non-text elements usage. First of all, Government Archives and Ministry of Foreign Affairs websites use improper image sizes from the point of accessibility. On the other hand, all websites use appropriate image types (i.e. .gif, .jpeg, .bmp) that users easily open.

Most of the presented multimedia elements are downloadable from websites. The agencies must inform the users about the download time with the different internet speed. Most of the websites do not provide this kind of information.

4.1.1.13 Search

This section evaluates the websites search function. Each of the evaluated websites results are displayed in the Figure 4-24. The average result of the 33 websites is 66.1 %. Found problems are listed in terms of search issue of the websites:

- 10 of the evaluated websites do not provide content search services inside their pages such as Ministry of Justice and Undersecretariat of Maritime websites.

- Nine of the evaluated websites provide search function with the help of search engine; some of these websites are Turkey E-Government Gateway and Ministry of Interior websites. Eight of the websites provide both simple and advanced search options.

- Prime Ministry of Turkey, Government Achieves, Grand National Assembly of Turkey websites do not allow the users to make search away from the main page.

Figure 4- 23 Image and multimedia elements section results

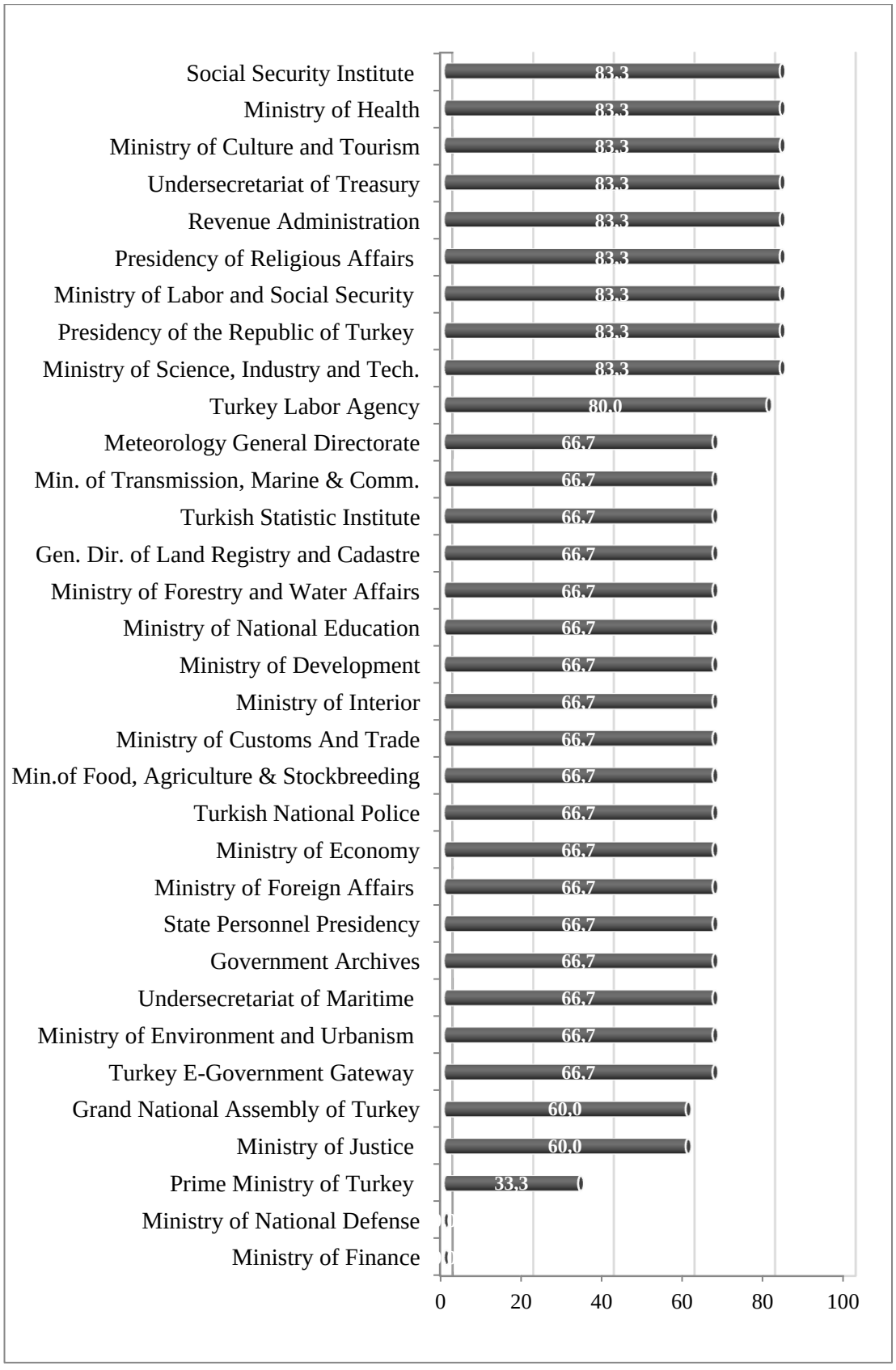


Figure 4- 24 Search section results

4.1.1.14 Contact

Contact information is very important for the citizens to reach the government institute. This study assesses the availability of phone number, e-mail address and communication forms for the Government Agency. Each of the evaluated websites results are displayed in the Figure 4-25. The average result of the 33 websites is 72,4 %. The encountered problems and results are listed in detail as follows.

First of all, all of the evaluated websites have “Information Acquisition” section that gives information about the "Right to Information Act" and collect the citizens’ information acquisition requests. Some of the evaluated websites collect the request by electronic forms; some of them require written application. The application tracing process is also conducted in this section of the websites.

Moreover, almost all of the evaluated websites give the phone number of the government agency. But four of the e-government websites do not provide e-mail address of the institute. The others give e-mail address but six of them provide individual e-mail address instead of institutional e- mail address.

Besides the contact information, e-government websites allows citizens to send their critics, complaints and suggestions. 18 of the evaluated websites have a form to collect users’ complaints and suggestions. Moreover, the websites can offer surveys such as citizen’s satisfaction survey. Conducting a small sized survey is an effective and easy way to collect citizen’s opinion about the website. However, results show that few e-government websites prefer this method.

Frequently Ask Question (FAQ) section is an important feature for a website. When users need help, they usually examine the FAQ part before contacting the institute directly. 20 of the evaluated websites have FAQ section in their websites.

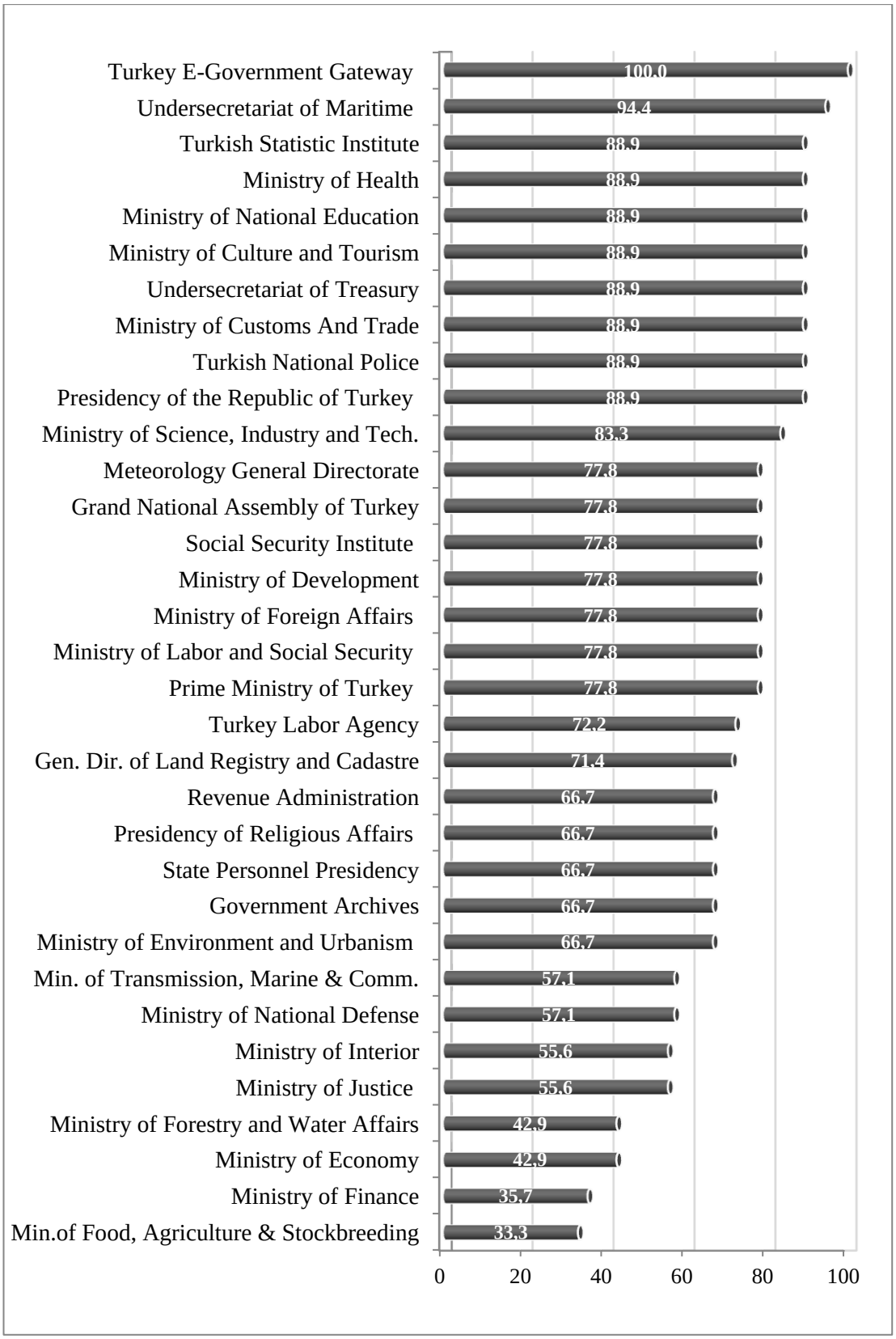


Figure 4- 25 Contact section results

4.1.1.15 Metadata

In this section websites metadata usage are examined. Specially, source code of each website is controlled if it includes website language information, author, keywords and descriptions. The results are shown in Figure 4-26. Overall average score of this section is 65,2 %. According to Figure 4-15, Turkey Labor Agency evaluation result is 0 because of the lack of metadata usage.

The average is low, since only 17 of the websites use metadata in their websites. Also, most of the websites do not contain the author and keyword information which ease to be displayed in search engine results.

4.1.1.16 Website Content Archiving

With the development in technology, almost all government information is served to the citizens via online applications. For this reason, online website archiving has become a necessity. Websites usually archive their announcements, news and regulations. Archiving section evaluation results are given in the Figure 4-27. The average result of the 33 websites is 77,3 %. The results also show that there are no archiving works on five of the websites; these are Undersecretariat of Maritime, State Personnel Presidency, Presidency of Religious Affairs, Turkish National Police, and General Directorate of Land Registry and Cadastre

According to results, 18 of the websites archive their contents. Some of websites make an archive catalogues and provide detailed search options. Users can scan the desired information by specifying date interval, title and keyword.

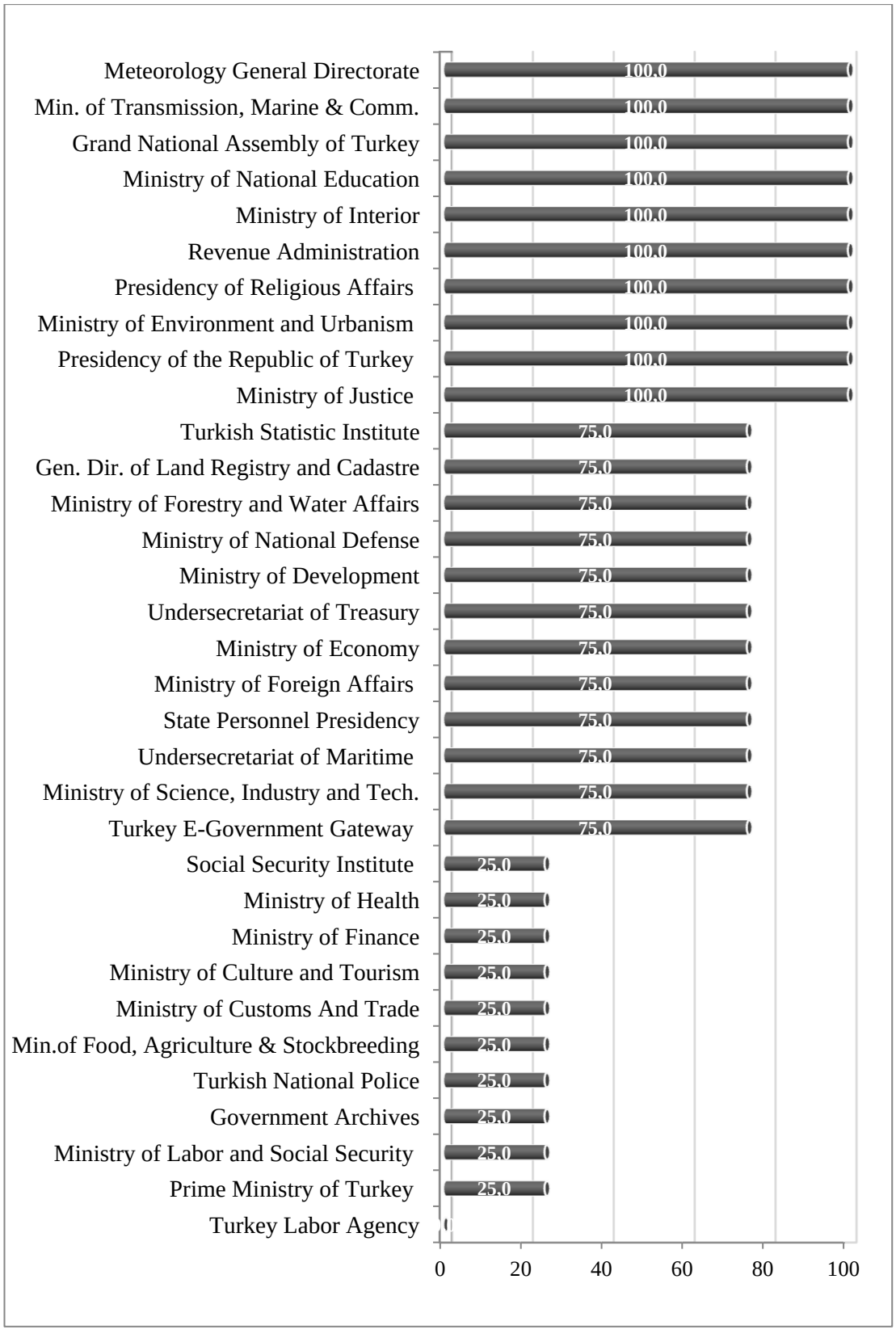


Figure 4- 26 Metadata section results

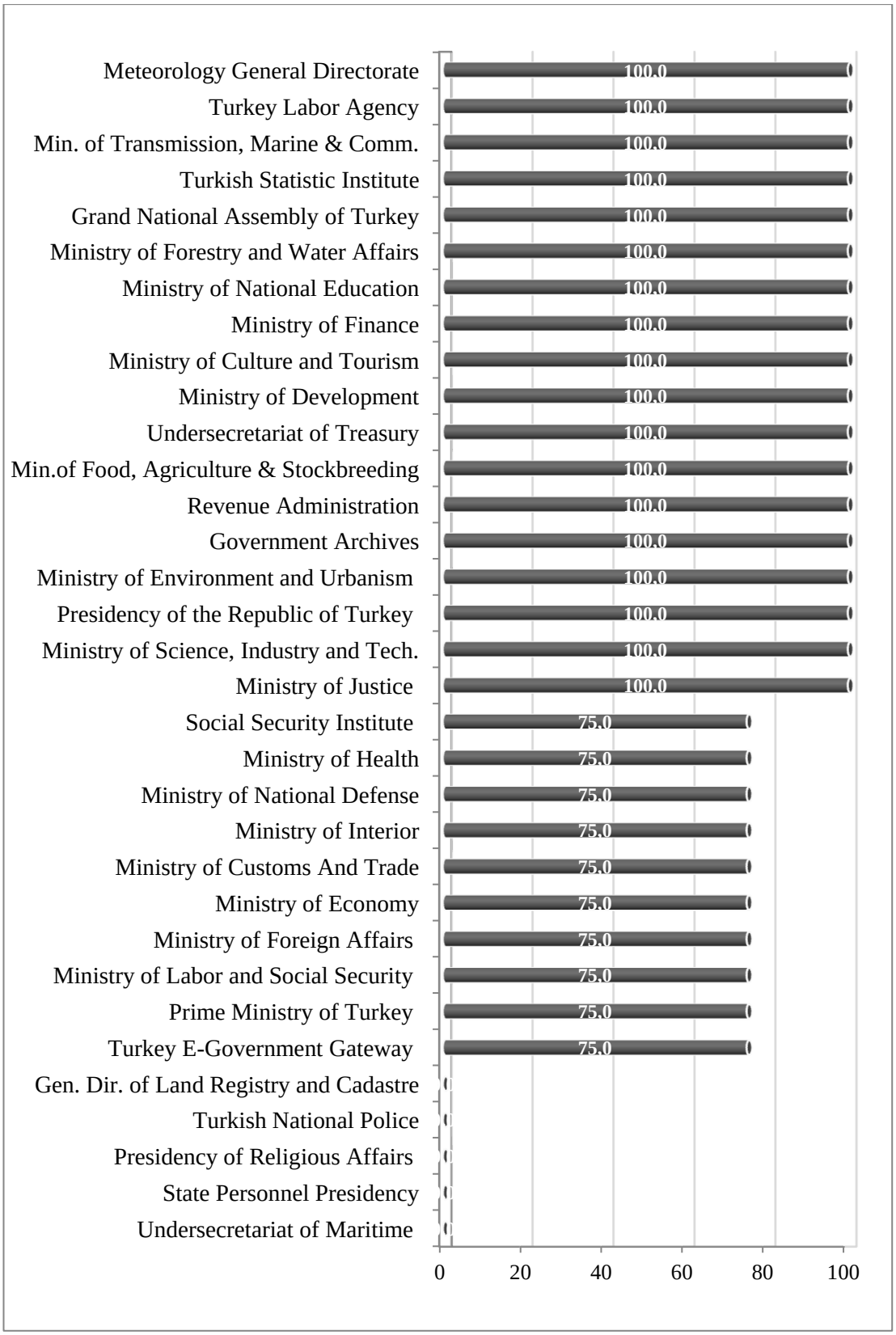


Figure 4- 27 Website content archiving section results

4.1.1.17 Personal Information Privacy and Security

This section examines privacy and security policies of e-government websites with following two questions:

- Does website provide a guaranty explanation in satisfying that the personal information of users would be safe and would not be shared with third parties?

- If users use a credit card in the website, do the necessary security applications (SSL, 3D Secure) exist in the page?

The evaluation results are given in the Figure 4-28, the average results of this section is 15%. Also 27 of the evaluated websites' results are 0 for following reasons.

- There is no need to use credit card in these websites, so that the second evaluation criteria is not applicable for these websites.

- Almost all websites have form applications (such as information acquisition right application) that request some personal information entrance (such as Turkish ID Number). However, there is no explanation to the users in satisfying that their personal information would be safe and not be shared.

Moreover, most of the e-government websites provide e-government services on the E-Government Gateway website, since they think that this platform is more secure. Only Revenue Administration website contains SSL and 3D secure controls.

4.1.1.18 Publication of Website

This section evaluates the appropriateness of the e-government website domain name. In addition, it assesses the alternative domain name usages. The results are displayed in Figure 4-29. The average score of this section is 85,5 %.

The results reveal that almost all of the evaluated websites use appropriate domain name as a governmental institute. However, 15 of the 33 evaluated websites do not take into account alternative domain name usage.

Figure 4- 28 Personal information privacy and security section results

Figure 4- 29 Publication of website section results

4.1.2 Website Based Evaluation

The study sample consists of 33 e-government websites and the overall scores for each of the website are displayed in Table 4-3. In the table, there are two evaluation scores. One is weighted average; this score is calculated according to importance of the categories which are described in the Table 3-2. The other score is arithmetical average. Moreover, each websites' section based findings are presented in Appendix B.

Table 4- 3 Website based evaluation results

Institute Name	Weighted Average	Average
Turkey E-Government Gateway	88,8	88,4
Social Security Institute	78,3	79,4
Presidency of the Republic of Turkey	77,5	79,9
Ministry of Foreign Affairs	77,2	75,5
Turkish Statistic Institute	77	77,5
Ministry of Justice	76,5	76,3
Ministry of Science, Industry and Tech.	76,1	77,5
Ministry of Culture and Tourism	76,1	76,7
Prime Ministry of Turkey	75,3	76,1
Ministry of Forestry and Water Affairs	74,8	77,3
Revenue Administration	74,7	74,4
Meteorology General Directorate	74,7	77,4
Undersecretariat of Treasury	73,5	75,5
Ministry of Development	73,2	75,6
Ministry of Environment and Urbanism	73	74,1
Ministry of National Education	73	74,4
Turkey Labor Agency	72,5	72
Ministry of Economy	71,6	73,8
Ministry of Interior	71,6	73,2
Min. of Transmission, Marine & Comm.	71,4	73,7

Institute Name	Weighted Average	Average
Ministry of Health	71,2	71
Presidency of Religious Affairs	70,8	70,9
Ministry of Labor and Social Security	69,1	69,1
Grand National Assembly of Turkey	69,1	68
Government Achieves	68,5	67,4
Gen. Dir. of Land Registry and Cadastre	67,3	67
Turkish National Police	67,6	66,6
Undersecretariat of Maritime	67,5	67,6
Ministry of Customs and Trade	67,3	66,8
State Personnel Presidency	66,6	66,7
Ministry of Food, Agriculture & Stockbreeding	66,4	69,5
Ministry of National Defense	65,4	65,5
Ministry of Finance	61,2	62,8
Average	**72,2**	**73**

According to user-centered website evaluation results, the performance of the agencies changes between 88,8 to 61,2 where the weighted average is 72,2 and arithmetical average is 73. Explanations are provided in detail according to weighted average results:

- **Score of the one website is higher than 80:** It is a well designed website in which most of the required features are satisfied. However, some points are still missing. Especially, accessibility issues must be improved. Non-color options of the website increase accessibility function. Also search function must be enhanced with adding detailed search options. Metadata content must be completed; author of the website must be specified.

- **Score of the eight websites are between 75 and 80: R**esults of these eight websites can be considered as good, the results are over the average (73). But, the websites cannot fulfill all user-centered design requirements. Some parts

need to be improved and corrected. Almost all of these 8 agencies do not provide accessible websites. Besides this, adequate contact information is not provided.

Moreover, there are many problems related with the navigation. The next and previous navigation buttons are not used. Also, some broken links exist. Page titles are not clearly defined in five of these pages. In addition, the security and privacy issues are missing in some of these eight websites which do not provide information regarding the personal information security.

- **Score of the 13 websites are between 70 and 75:** These websites gather an average score according to the user-centered website evaluation approach. But, they contain some errors and insufficient services. First of all, similar accessibility, privacy and security, metadata and navigation problems are seen in these websites. Beside this, homepages of the websites are not offering the necessary services such as Government Institute' logo, site map, search options and contact information.

  Display based controls are also not included effectively. There are some problematic issues such as wrong data type inputs are not prevented. The feedbacks are not sufficient and do not warn users to correct their mistakes.

- **Score of the 11 websites are between 60 and 70:** The service quality of these websites can be evaluated as poor. The website organizations are problematic, there is no structured design. Menus are complex so that users are faced with problems in finding desired information. The pages are not consistent. When users navigate to a new page in the webpage, the page organization is changing; the menu is placed to a new position in the page. Also, page titles are not unique for each webpage, as a more important point, few websites do not use titles, for this reason, users get lost in the pages.

In addition, the text appearances are not appropriate; some of the websites have color contrast problems and prefer small font sizes which make reading difficult. Most of the websites in this scale do not get archive.

The common problems are unfortunately valid for these website groups. Accessibility, metadata, personal information security and privacy and navigation features are problematic.

4.2 Interviews

The questionnaire which is presented in Appendix A, aims to find out the approach of the e-government designers in terms of user-centeredness. The questions are divided into four sections: functionality, usability, accessibility and general questions. The questionnaire was conducted as an interview with the eight government institutes. These are:

- E-government Gateway
- Ministry of Justice
- Republic of Turkey Ministry of Customs and Trade
- Turkey Labor Agency
- Republic of Turkey Ministry of National Education
- Turkish Republic Social Security Institute
- Turkish Republic Transmission, Marine and Communication Ministry
- General Directorate of Land Registry and Cadastre

The interview duration range changes between 30 minutes to 60 minutes. In this time frame, approaches and processes to design, develop and maintain e-government websites are examined. The obtained results are presented in remaining sections.

4.2.1 Functional Evaluation

The first question is related with determining website main aims. The institutes gave different answers for these questions:

- One of the organizations mentioned that website aims were determined by the top management of the agency.

- Three of the organizations emphasized the importance of the main target determination. They conducted a study to identify the website aims. Business analysis and then the feasibility study were conducted.

- The other institutes indicated that main target determination is based on the experiences and the opinion of sub-units within the organization

The second question concerns with the target audience profile. Most of the agencies stated that their audience was certain according to given services. They generally said that their user group covered all citizens. On the other hand, some of the agencies specified their user group. For instance, Ministry of Justice declared that 75 % of the institute audience was law related people, 20 % of them were related with media and rest of them other citizens.

The third question in this section focuses on whether the user expectations are collected and taken into account in the design phase of the website development.

- One of them stated that small user groups are made and users' needs are collected. The other Government Agency mentioned that they made a lot of meeting with potential stakeholders to determine the user needs.

- Three of the interviewed agencies indicated that the new version of the website was developed in accordance with the given feedbacks to the existing websites by the users.

- Remaining agencies made multilateral talks with the sub-units of the agencies. They collected the sub-units requests and decided to add into the website content.

The fourth question aims to find out the studies conducted to make appropriate website design according to target audience.

- One of them emphasized that different user profiles need to achieve their service, for this reason, they tried to keep website usage simple and clearly understandable instead of visuality. Another agency stated that they preferred to select familiar colors for the user group.

- Two of them mentioned that they conducted this kind of study within the agency; they determined contact points in the institute and get their opinions in the design phase.

- The remaining agencies indicated that they did not perform a study to involve citizens in to the design phase. Instead of this, they collect the user feedbacks after the publication of the website; they make changes according to user needs if they find it applicable.

The last question in functionality section is about the determination process for the priority of the tasks in the webpage. In other words, it is tried to find out how government agencies ordering the contents and tasks in the websites. They gave different answers. Some of them stated that these types of ordering are decided by the top management. Some of them mentioned that they took into account the significance levels of the tasks or the content. If the tasks or the content were very important, they preferred to serve in the top side of the websites. Two of the interviewed agencies indicated that they made an arrangement according to frequently used services.

4.2.2 Usability Evaluation

After providing the definition of the usability, it was tried to investigate usability studies of the government institutes. The first question targeted to investigate usability studies that were conducted by the agencies.

- Only two of the government agencies conducted structured studies. One of them firstly examined the usability issues of the website with the agency personnel; they especially get other units' opinions from agency. Then they made usability testing with small user groups. The other government agencies get professional help for the usability. The analysis conducted by the third party company that conducts eye-tracking test and usability analysis with disable people.

- Two of the interviewed agencies wanted to skip these questions. Remaining institutes mentioned that agency personnel control the website and provide feedbacks to the designer before the publication of the website.

Another question was related with website usability objectives and criteria. Agencies were asked if they have usability objectives and criteria. One of the institutes stated that they aimed to design text-heavily websites which operate with different browsers. Three of them mentioned that they used Türksat Guide Book for determining usability issues. Four of them preferred to skip this question.

In addition, usability standards usages were investigated. Two of them indicated that they did not use any standards. Remaining websites took into account the Türksat study ("Kamu Kurumları İnternet Siteleri Standartları ve Önerileri Rehberi") and Comptroller Presidency report.

Moreover, the availability of responsible team or person was investigated about usability issues. The results display that most of the agencies do not have specific team or personnel for usability. They indicated that website developer units are also responsible for the usability issues.

The last question about the usability was focused on how agencies develop usability of the e-government websites. They stated that they made changes in the website concerning the users opinions and requests.

4.2.3 Accessibility Evaluation

This section aimed to investigate the studies conducted to provide accessibility for all of the citizens especially disable people. The first question was about how government agencies provide accessibility. Four of them have carried out some studies for providing accessible services. Two of the agencies made an interface for the sight-disabled citizens. Moreover, two of the government agencies stated that they took into account W3C accessibility requirements while designing the websites. In addition, two of the interviewed institutes conducted test with screen reader program in order to assess readability of alt texts, scripts and applets. The remaining interviewers mentioned that they had not carried out studies about the accessibility.

The second question was aimed to investigate the usage of accessibility standards while developing websites. Two of them mentioned that W3C standards are used and other two of the interviewers said that they used Türksat study ("Kamu Kurumları İnternet Siteleri Standartları ve Önerileri Rehberi").

The last question investigated whether the government agencies conducted usability testing with disable users. Two of the e-government institutes worked with Administration of Disability government agency, they made a usability test with disable people.

4.2.4 General Questions

In this section, there are six questions related with the different features of the e-government websites. The first question was targeted to find unit responsible for the website design, maintenance and services. General Directorate of Service Provision, Information Technology Department, IT Department units were responsible to give the answers.

The second question was concerning the usage rate of the websites. Government agencies provide great deal of services but most of the people are not aware of the available online services. The next questions also investigated promotion activities of the websites. Most of the agencies stated that they keep detailed statistics such as city-based usage rate, which tools are used to access the websites (iphone, tablet, pc and etc) and which pages have more usage rates. They mentioned that they could make some arrangements according to these statistics. For instance, they create an iphone application to increase the usage effectiveness. On the other hand, a few studies were conducted for promotion activities to increase sage rate of the websites. It is deduced from the interview that government agencies do not give importance to the promotion activities of the website. They think that as a government agency they do not need to make advertisement.

The fourth question was related with update procedure of the websites. Almost all of the government institutes indicated that their websites were up to date. They get information from other units of the agencies and update the websites.

The fifth question focused on the collection methods of user expectations, needs and complaints. Most of the government agencies get this information from the given e-mail address in the websites. Few websites used electronic form about these issues. The evaluation process of users' opinion, needs and complaints were also asked. They indicated that the institute evaluated the appropriateness of these desires and then took action accordingly.

The last question was about information security studies and information security policy of the websites. Five of the interviewed Government Institute preferred to skip this question. One of them stated that the agency has an Information Security Department which is responsible to provide information security and policy. The other institute mentioned that the information security studies were considered such as installing firewalls, took logs and etc.

4.3 Problems:

At the beginning of the study, it was aimed to interview at least 16 Government Institutes. However, only eight institutes accepted interview request. Following problems were encountered during this process:

- At the beginning of the study, the contact points of the each institute were determined. They were informed about the study in detail by telephone and e-mails. After that, some of the institutes requested to see the questionnaire. It was sent with the information that they are free about answering questions. Then, we gave time to them to examine the questionnaire. Some of them did not give any answers after the end of this time; some of them rejected the interview request and indicated that they do not want to answer questions for security reasons.

- In general, the contact point was the Head of Information Technology Department of each Institution. At the beginning of the interview, s/he directed the questionnaire to other personnel and gave his/her contact information. In many times, the new contact point rejected to the answers questions. For instance, one of the new contact points requested an application via official letter. So that, getting permission for interview became a long process.

- During the interviews, the interviewers wanted to skip some sections totally such as accessibility section. They are aware of that they do not make enough

work on accessibility issues, instead of answering the questions indicating this; they preferred to skip the whole section. So that, the demanded data could not be collected from the interviews.

4.4 Syntheses of the Evaluation Tool and Questionnaire

The website evaluation results and interview findings are matching. Table 4-4 shows the results briefly.

Table 4- 4 Syntheses of the Evaluation Tool and Questionnaire Results

Matching Item	Interviews	Website Evaluation
Designing website according to target audience characteristics	Three of the institutes conducted a study to understand user characteristics. Four of the institutes designed website according to experiences and top management requests.	Few websites use technical terms that is difficult to understand by the citizens. Almost all evaluated websites prefer font types that are familiar to the users. 17 of the websites' content organization are complex. 15 of the evaluated websites do not provide appropriate feedback.
Priorities of the basic tasks	The institutes prioritized the tasks according to top management decisions, tasks usage rates and importance of tasks.	17 of the websites have complex organization. It is difficult to find information in these websites.
Usability studies of the website	Only two agencies conducted usability testing with user group.	24 of the evaluated websites do not use "next" and "previous" button. Broken links exist in some websites.

Matching Item	Interviews	Website Evaluation
	Four of the institutes evaluated usability issues with their personnel. Remaining agencies did not give information about the usability issue of the website.	6 of the evaluated websites do not contain sitemap 6 of the evaluated websites have horizontal scrollbar problem. 18 of the evaluated websites have problems about the page titles. 14 of the websites do not give proper feedback to the users.
Accessibility of the website	Two of the agencies made an interface for the sight-disabled citizens. Two of the agencies tested the website with screen reader program. Two of the e-government institutes made usability test of the website by disable people.	Accessibility evaluation result is 60.5 %. This result shows that most of the websites do not provide accessibility.
Accessibility standard usage	Two of the agencies considered W3C accessibility requirements.	Only two of the websites fulfill the WCAG W3C priority 1 accessibility requirements.
Collecting user expectation and request	Most of the websites get user expectation and request with e-mail.	Evaluation result of the contact information section is 72 %.
Providing Information Security	Three agencies took actions for security issues of the websites.	27 of the websites do not provide any information regarding the security and privacy issues to the users.

CHAPTER – 5

DISCUSSION AND CONCLUSION

Assessment of e-government efforts plays an important role to define success of e-government services. But, measuring the user satisfaction is more crucial. This thesis intends to assess e-government websites based on user-centered approach. It focuses on the user involvement of the e-government website development. For this purpose, we made interviews with eight Government Agencies. We aimed to find out government agencies designers' attitude to take into account user requirements and limitations at each stage of the website development.

Moreover, Türksat's e-government website evaluation tool was improved. The tool contains assessment with respect to three key elements of the user-centered design, which are functionality, usability and accessibility. Then, 33 e-government websites were evaluated with this tool. It is a comprehensive study that examines the websites in 18 different aspects, these are: accessibility, software and hardware, usage improvement, homepage, page layout, navigation, scrollbar and inside page navigation, inside page titles and website titles, links, text appearance, data inputs - display based controls, image and multimedia, elements, search, contact, metadata, website content archiving, personal information, privacy and security and publication of website.

When examining the whole results, we interpret that the designer's attitude towards the user-centered design approach affects the effectiveness and benefits of website's services. The main evidence of this situation is about usage rate of e-government

websites. According to Türksat Survey conducted in 2009, 40 % of citizens indicated that a reason of not using e-government websites was unavailability of desired services over the internet (Information Society Statistics, 2011). In interview, we asked a question to the designers about the collecting user requirements before website design stage. Most of them mentioned that they did not make a study to analyze citizens' requirements. Some of them determined services of website based on the top management requests. For this reason, citizens cannot gain enough benefits from e-government applications for which great deal of investments have been made.

According to user-centered design approach, user characteristics must be identified before the website development. Website design must be realized based on user characteristics. On the other hand, many interviewed agency did not give the necessary importance on this issue. Therefore, citizens are subject to some problems while using e-government websites. For example, four evaluated websites (Ministry of Customs and Trade, Ministry of Justice, Ministry of Foreign Affairs and Presidency of Religious Affairs) contain technical terms and abbreviations which are not understandable for many citizens.

Another issue that makes problems for the citizens is prioritizing the website's contents. It was examined that, some of e-government websites locate Presidency of Government Agency activities, programs and speeches at the top side of the website in a large area. Citizens' requested services are located in the remaining part of the website. According to websites evaluation results, 51 % of evaluated websites have content hierarchy problems. Therefore, citizens loose time to access requested services.

Furthermore, in the interview, usability studies of e-government websites were asked. Few of them conducted comprehensive studies about usability, especially they made small user group and performed in-process usability testing. On the other hand, other interviewers did not give great importance on this issue. They mentioned that their staffs evaluated their website before publishing via internet. This attitude causes

usability problems in the websites. Because, government agency's staffs are familiar with the services and they cannot find usability problems as citizens view. These websites failed in usability related evaluations such as navigation, usage improvement and page layout and etc.

Citizens need to make connection with online government agencies, especially they require to get quick response from them. Eight interviewed government agencies mentioned that they answer all citizens' questions as soon as possible. Also, according to websites evaluation results, almost all of the evaluated websites provide the phone number and e-mail address of the government agency in the websites. On the contrary, according to Türksat study, great deal of enterprises and households did not prefer to use e-government services because they found that contacting public agencies over the Internet was very complicated and there were delay of feedback in emergency situations (Information Society Statistics, 2011). Also, according to United Nations e-Government Survey results (2010), Turkey's e-Consultation score is 18,18 % which means that Turkey's e-government services had poor performance about communication among government, citizens and businesses. As a result, public agencies must give more attention providing response to the citizens to eliminate these problems. They can also use some methods. For example, they can provide online help (such as chat) to the citizens like online banking application.

Although the main advantage of the e-government website is 7/24 service provision to the citizens, there were some problems for accessing online public services. For example, Ministry of Finance website was not available more than three days because of hackers' attacks. Government agencies must archive their online contents regularly and restore websites in this case as soon as possible.

Accessibility studies were also asked to the interviewers, half of them mentioned that they had not carried accessibility studies. Also, accessibility section average is very low, it is 60,5 over 100. Only four e-government websites conducted accessibility studies, but these studies are still insufficient. Remaining websites need comprehensive efforts to decrease accessibility problems in their websites. Important

problems on this issue were found similar to Website Accessibility for the Visually Impaired People and Web Accessibility and e-Democracy study (Şat, 2011). She evaluated seven e-government websites concerning accessibility issue and listed problems such as poor navigation, non-operating shortcut keys, wrong color-contrast usage and etc. She stated that these problems interfere disabled people to access e-government services. For this reason, public agencies must understand requirements of the disabled people and take into account these requirements while designing the e-government websites. It is beneficial to prepare alternative design for disabled people.

5.1 Turkey E-Government Websites Situation

In Turkey, 9.6 billion TL has been reserved to the ICT investment between 2002 to 2011. Almost 70 % of government services have been provided via electronic channels in 2011 (National Statistic Institute, 2011).

In this study, Turkey's 33 e-government websites were evaluated in a comprehensive manner. Overall performance of these websites is 72.2 %. The performances of the agencies change between 88,8 to 61,2. Only one website' score is higher than 80 %. eight websites' scores are between 75 and 80. 13 websites' scores are between 70 and 75. 11 websites' scores are between 60 and 70.

These results show that although significant progress has been made, e-government websites have not been reached the desired maturity. For instance, citizens still cannot gain enough benefits from these services. Usage rate is not enough and government agencies do not give great importance to promote their services.

Moreover, users' demands and expectations are not considered. Citizens cannot find desired services via internet. In addition, there are serious accessibility problems, most of government agencies websites' cannot be used by disabled citizens. Frequently encountered accessibility problems are:

- W3C priority 1 accessibility requirements are not provided.

- The font size is not big enough to see.
- Color contrast problems exist.
- Alt text is not used for all images.
- Script and applet cannot be readable from screen reader program.
- Form usage is difficult.
- Feedback is not sufficient.
- Audible option of captcha property is not used.
- Website do not provide text alternatives to non-text items and vice versa.

Furthermore, many e-government websites are poorly organized. Content hierarchy is complex, menus are not consistent and contain too many items. Websites do not locate the important information in the top side of the website.

In addition, content search services do not provide proper results, users usually cannot find desired information with using search function in the website. Also, 17 of the evaluated websites failed to provide text appearance consistency.

Besides, there are poorly designed form applications in many e-government websites. For instance, system allows users enter wrong data type and does not direct users with proper feedbacks. It also accepts the application with wrong data.

Finally, navigation problems still exist in the e-government websites. There are broken links, wrong connections and etc.

In order to overcome these problems, designers must conduct a systematic study, they can use a methodology to design user-centered websites. According to literature review, website evaluation results and interview results, this thesis concludes with an methodology and design recommendations to develop effective e-government services based on user-centered approach.

5.2 Methodology

User-centered design is an approach that puts the targeted users of a site at the centre of its design and development (UPA, 2006). This thesis recommends that user-centered design approach increases user satisfaction level of e-government services.

In order to make website based on this approach, user centered design methodology can be used. As it is shown in Figure 5-1, our user centered methodology consists of six main stages (ISO 13407 Human-centered design process and Jokela user-centered design process model were evaluated in order to make methodology that is displayed in Figure 5-1 (Vipola, 2008)). This process is both sequential and iterative.

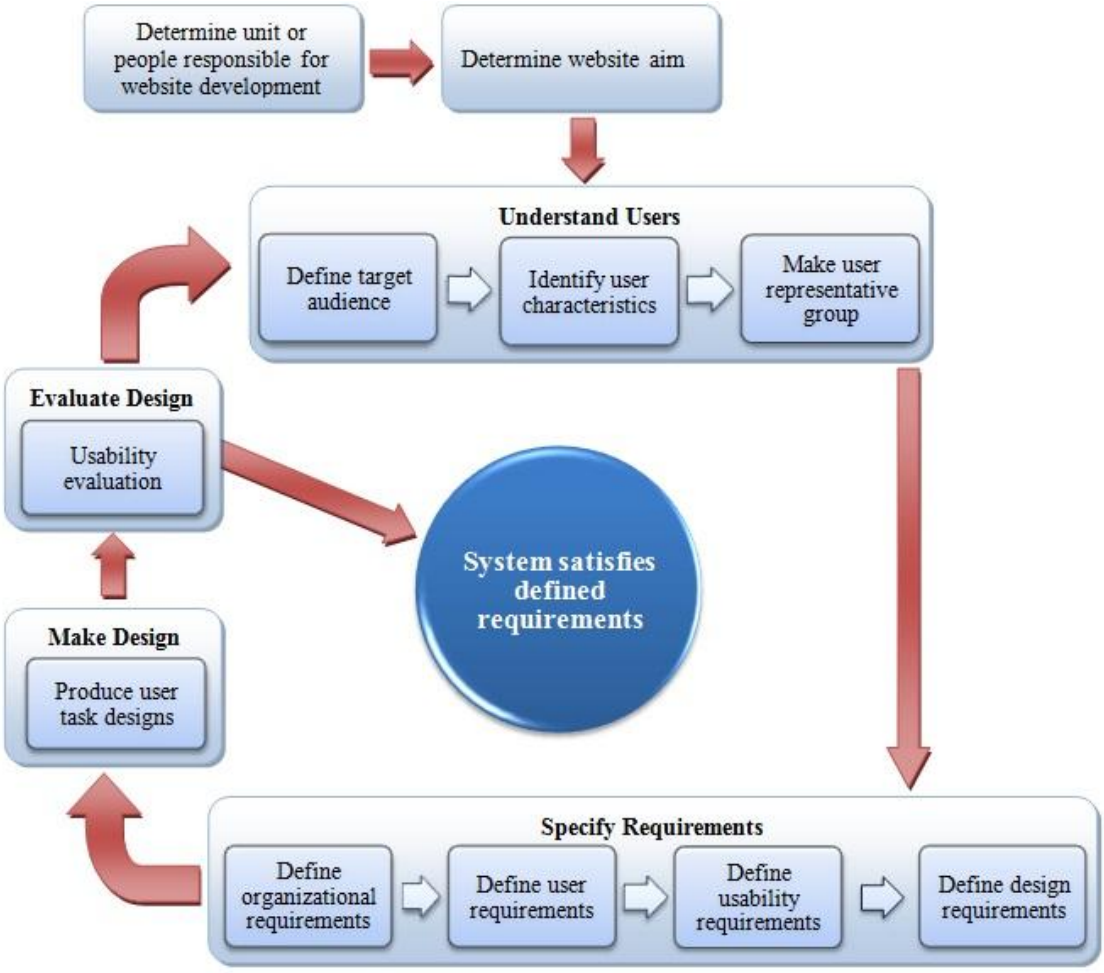


Figure 5- 1 User-centered design methodology

Below is a description of the six stages in the user centered design approach.

- **Define responsible for website:** The methodology begins with determining unit or people that will be responsible for the website development and maintenance in the agency.

- **Determine website aim:** The aim of the website should be determined clearly.

- **Understand users:** The target audience must be determined. The characteristics of the intended users must be identified. An involvement of intended user is essential for design process. It is beneficial to select sample user group and to conduct usability tests with this group at each stages of websites development. So that, user involvement is provided from planning phase to publication phase of website development. Also, scope of the website contents, prioritization of existing services, interface design of website and usage of language must be shaped according to user needs.

- **Specify requirements:** Government agencies must determine organization requirements about the offered services. They also identify and understand the users' needs. A survey or a questionnaire can be conducted to collect users' demands.

  E-government websites' designers must define usability requirements that are related how easy the system use. The usability requirements must be tangible in order to verify and trace them during development (Lauesen & Younessi, 1998). The website design requirements must be also determined.

- **Make design:** The website must be designed according to defined requirements. Designers must be work with representative team of users and get their opinion while designing the website. For example, designers can give a task list to the users and want them to prioritize tasks.

- **Evaluate design:** Usability evaluation must be conducted to find out whether websites satisfy defined requirements. Users can be asked to complete given tasks and designers observe users accomplishing their tasks. Users feedbacks must be gathered early and often, and these feedbacks drive website design.

  Website usability evaluation must be conducted periodically. It is better to make e-government website usability evaluation in independent institutions.

5.3 Guideline

This section provides recommendations about e-government website development.

5.3.1 Accessibility:

- The website should be prepared according to W3C priority 1 requirements. Some test tools can be used to assess conformity of these requirements such as SORTSITE tool, ACHECKER, WAVE and etc

- The websites must be tested by screen reader programs. Script and applet applications must be tested with screen reader programs. Also, all non-text items in the websites must have text explanations for hearing-impaired citizens. It is beneficial to prepare alternative web pages that contain only texts which ease the accessing information with screen reader program for vision impaired citizens.

- Appropriate color-contrast must be used for color blind people. Websites must be tested by color-contrast checker software such as Check My Color (http://www.checkmycolours.com), Color Filter (http://colorfilter.wickline.org) and etc. It is beneficial to prepare alternative websites with non-color options for color-blind people.

- Form usage is very difficult for disabled people. To ease form usage, the cursor must be stated at the first input box. Labels must be explanatory. The

short-cut keys and tab key must be worked in the websites. Feedback provision is very crucial. When users make an error, the websites must guide users with provision of the proper feedback. The websites must direct users in case of error. Also, appropriate feedback and direction must be provided when users complete the form.

- Audible option of captcha structure must be to be provided for the disabled users.

- E-government websites must also be customized for other technological devices such as mobile phones, PDA, tablet PC and etc.

5.3.2 Software and Hardware:

- While designing the e-government websites, potential users' technological infrastructure must be considered such as internet speed and computer performance.

- Designers must avoid unnecessarily large graphics that slow page download time.

- Websites must be compatible with different internet browsers and different screen resolutions.

- Websites must work in all operating systems and users should not be forced to install additional software in order to access critical services.

5.3.3 Usage Improvement:

- Organization of websites must be clear, simple and understandable to decrease the cognitive load of citizens. Users should not be subject to remember information from previous pages.

- Frequently used services must be located appropriate place where citizens easily access.

- Technical terms and abbreviations must be explained.

- Help sections must be prepared. It is better to provide webpage specific help contents. For instance, designers can prepare help content as a data entrance example for the form application in the webpage.

- Users must be informed about the existence of time-out applications in the websites. Users can take additional time to continue their applications.

- It is better not to use pop-up applications in the website.

- Essential functions must be available without leaving the website.

- Designers must define file names meaningfully. Also, they must use lower case letters and they must avoid using space character in order to name the files.

5.3.4 Homepage:

- Homepage is the most important part of the websites. Effective homepage eases website usage. The home page must be accessible from all pages in the website.

- All major parts of the website must be accessible from the homepage

- Websites must contain the Government Agency's logo, contact information, site map and search function.

- Homepage structure must be simple. Long paragraphs must be avoided in the websites.

5.3.5 Page Layout:

- Use of different font types and font sizes must be avoided. The target audience familiar font types must be used.

- The same page layout must be used in all pages of the websites to provide consistency.

- Contents must be placed into websites according to importance. The most important and current information must be located at the top of the websites. In order to emphasize the up to date information; "New", "New added" and "New updated" indication labels with date information must be used. In addition, website's last update date must be involved in the website.

- There must be space between the paragraphs. Moreover, the line length is important, more than 100 characters in each line makes readability difficult.

5.3.6 Links and Navigation:

- A website's navigation scheme allows citizens to use website in a more effective and efficient manner. Designers should ensure that users have access to the requested page with few clicks. Anchor link structure is also useful to for long pages.

- Navigation button must be grouped in the website, and the place of the buttons must be consistent.

- It is beneficial to add next and previous l in websites.

- There must be text links alternatives for the graphic links in the websites.

- The links' labels and targeted pages' titles must be consistent.

- Website must be tested in terms of broken links. There are some automated tools to find broken links in the website such as Sort Site.

- Bread crumbs technique can be used to give users information of where they are. This structure also gives chance users to switch between previous pages easily.

5.3.7 Scrollbar and Inside Page Navigation:

- Serving the large amount of contents within limited page layout is very difficult. To overcome this issue, some techniques should be used. Instead of scrolling, page numbering is more efficient for some cases such as serving announcements, news and search results.

- Marquee is also applicable for providing more content in a limited place. But, the marquee must be controlled by the users.

- The website designers do not prefer to use horizontal scrollbar which slowdown the navigation processes in the websites.

5.3.8 Website Titles:

- Many users prefer to skim the page instead of consuming time to reading whole content. The effective usages of titles provide review of the website easily. Also, e-government websites' designers must use page titles to provide general information to the users.

5.3.9 Text Appearance:

- The website must be readable with different screen resolutions. The most usage screen resolution has been 1024 x 768 in last three years. However, with the development of technology, different screen sizes and resolutions have been used. In order to provide appropriate website appearance in different resolutions, CSS structure can be used.

- The designer must avoid font types which are difficult to read and must select user familiar font types that accelerate reading.

- Font size usage is also important. Designer should consider the vision impaired people and select larger font size. According to Türksat study conducted in 2009, users are comfortable with 12-point Times New Roman, Georgia, Arial, Helvetica, or Verdana fonts (Türksat Guidebook, 2009).

- Designer must use lower case letters and prefer capital letters where necessary that increases users' reading speeds and noticeably. Also, bold, italic and underline options must be used when designer tries to take users' attention.

- Color contrast is also critical for the text appearance. Designer must test the website with color contrast checker programs such as Color Filter.

5.3.10 Data Inputs - Display-Based Controls:

- Data input section provides interactions between users and government institutes. Citizens can request e-government services such as achieving archive catalogue, finding the insurances and taxes values with using these applications.

- Data input fields' labels must be defined clearly. Moreover, sample data representation is beneficial for the clear representations.

- The size of the data entry field must match the size of the data that is entered from the users. Also, wrong data type entrance must be prevented. For example, e-government websites' developers can design the Turkish ID data entry field as 11 characters and not allowed to enter non-numeric characters. Therefore, the citizens' error rate will be decreased.

- The directions and feedbacks are very important for the users while making data entrance. Users must get proper explanation if they do not provide desired information. Besides this, when the data entry fields are filled out and confirmed by the users, the system must give a message whether process is successful or not.

- Mandatory data entry fields must be indicated appropriately in websites.

- If data entry fields consist of more than one page, the present page number and total number of pages should be indicated.

- The user can cancel all operations.

5.3.11 Image and Multimedia Elements:

- Using images and multimedia elements effectively helps users to understand the content easily.

- Designers should be aware that used pictures does not reduce the speed of page downloads. Appropriate file types must be used. According to State Planning Organization Principles of Interoperability guideline, jpg, gif, tiff and png file formats usage are recommended in e-government websites.

- Presenting a thumbnail image before providing whole image is a good idea. Users only achieve the desired pictures and do not wait for the other pictures loading time.

- Multimedia elements are an effective tool to take users' attentions. However, if it is not used properly, it makes users feel uncomfortable. Control of these elements must be done by users. For example, if a video is presented in the website, users must control starting and stopping videos. Automatically opening videos increase page load time.

5.3.12 Search:

- Many users prefer to find desired information by using search function. According to Measurement of Web Usability study (Webpage of Hacettepe University Department of Information Management usability study), users looked at the search function instead of accessing information from the menus. All e-government websites must have a search function.

- It is beneficial to serve basic and detailed search options. Users should be allowed to search in terms of date, keywords and titles. The result must be presented appropriately. The most relevant results are stated in the top of the results.

5.3.13 Contact:

- According to Information Society Statistics that were conducted in 2011, many users do not prefer to use e-government applications because they find contacting government agencies via internet are very complicated (SPO, 2011). Also, some users prefer face to face communication, because they need to ask questions and contact with public agencies. For these reasons, Governmental Institutes must give great importance to provide effective contact between citizens and public agencies over internet.

- The Institute e-mail address, phone number and address must be located in the main page that users see easily.

- It is beneficial to prepare forms that users are able to send questions, recommendations and complaints. Government Organizations must give high priority to this issue and provide feedback to users as soon as possible. In this circumstance, users will feel they can access the government services via internet.

- User satisfaction survey is very beneficial to collect citizens' perceptions of the websites.

- According to Information Acquisition Right, all websites should provide information acquisition application. The government agencies must satisfy the users' demands with a defined time period.

- Frequently asked questions must be provided.

5.3.14 Metadata:

- Designer must use metadata to facilitate recording of the search engine. Each website's metadata must consist of description, keywords, and author.

5.3.15 Website Content Archiving:

- Designers must archive online content of the websites in a defined period of time. The archive information must be easily accessible.

- In addition, website files, system logs and database must be archived at regular interval in case of any attack. Therefore, the agencies restore the websites in a short time.

5.3.16 Personal Information Privacy and Security:

- According to Information Society Statistics (2011) results, many citizens do not prefer e-government services because of privacy and security issues. They do not trust online application of e-government services. For this reason,

Government Institutes must take necessary actions and inform users in the websites such as:

- "The given information is not shared with third part organization"
- "The SSL and 3D security services are used in the website"

- Also, indicating security icons increase the trust level of the users to the e-government websites. These security icons can be:
  - Turning web browsers address bar color to the green, and
  - Appearing key lock icon at the bottom of the page.

- Copyright status of the information must be clearly stated.

5.3.17 Publication and Promotion of Website:

- Websites must be presented with appropriate domain name and alternative domain name must be used.

- The promotions of the website services are crucial. Many citizens are not aware of the services that are provided in the internet. The government agencies promote studies to introduce online applications.

5.4 Future Works

1. The website evaluation tool and questionnaire instrument were developed by testing on Turkish public sector websites. These instruments may be utilized for testing other countries e-government websites. Therefore, Turkey e-government websites evaluation can be compared with other countries. In addition, the evaluation criteria were not geographically dependent in general, we consider that the instrument may be utilized for testing government websites for the other countries.

2. An interview can be made with the more public agencies, so that, the analysis will be with conducted with more data.

3. An automated supporting tool for the system can be developed to facilitate the assessment. For example, the tool can make assessment on accessibility, text appearance, broken links, compatibility, search and display based control area.

4. User-cantered approach study can be repeated in the next few years

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APPENDICES

APPENDIX-A QUESTIONARIE

Participant's Information:

Name:
Job:
Education:

Functional Evaluation:

1. How did you determine the main targets of website? What are the targets of the website? Was business analysis performed?

2. How did you determine user profile? Have you considered disabled people?

3. Were the target audience's expectations collected? How was a study conducted on this subject? Did you make an arrangement according to user expectations?

4. How was a study conducted to make appropriate website design according to target audience?

5. Did you prioritize the tasks in the website? How were the priorities of the basic tasks expected from the website determined?

Usability Evaluation:

1. How was a study conducted to provide usability?

2. How were the website usability objectives and criteria determined?

3. How was the website usability testing performed?

4. Was user feedback received during the design phase of the website development? Did you conduct in-process usability testing?

5. Did you use any standard about usability?

6. Is there a team or a person responsible for usability subject?

7. Do you perform an improvement about usability issue?

Accessibility Evaluation:

1. How do you provide accessibility of website for each user? How was a study conducted to make disabled citizens use website services?

2. Did you use any standard about accessibility?

3. Did you conduct usability testing with disabled citizens?

General Questions:

1. Which unit is responsible for website design, maintenance and services?

2. What is the participation rate of users? How many citizens are informed about website's services? Do you keep any statistics on city basis?

3. How is planned to update the website? Is information always up to date?

4. How were users' expectations, demands and complaint of website collected? Do you give feedback to the users' opinions? How long does it take to give feedback?

5. How do you provide information security? How do you create the security policy?

APPENDIX-B WEBSITE BASED EVALUATION RESULTS

In this section of the thesis, 33 government agency websites evaluations results concerning user-centered approach are presented.

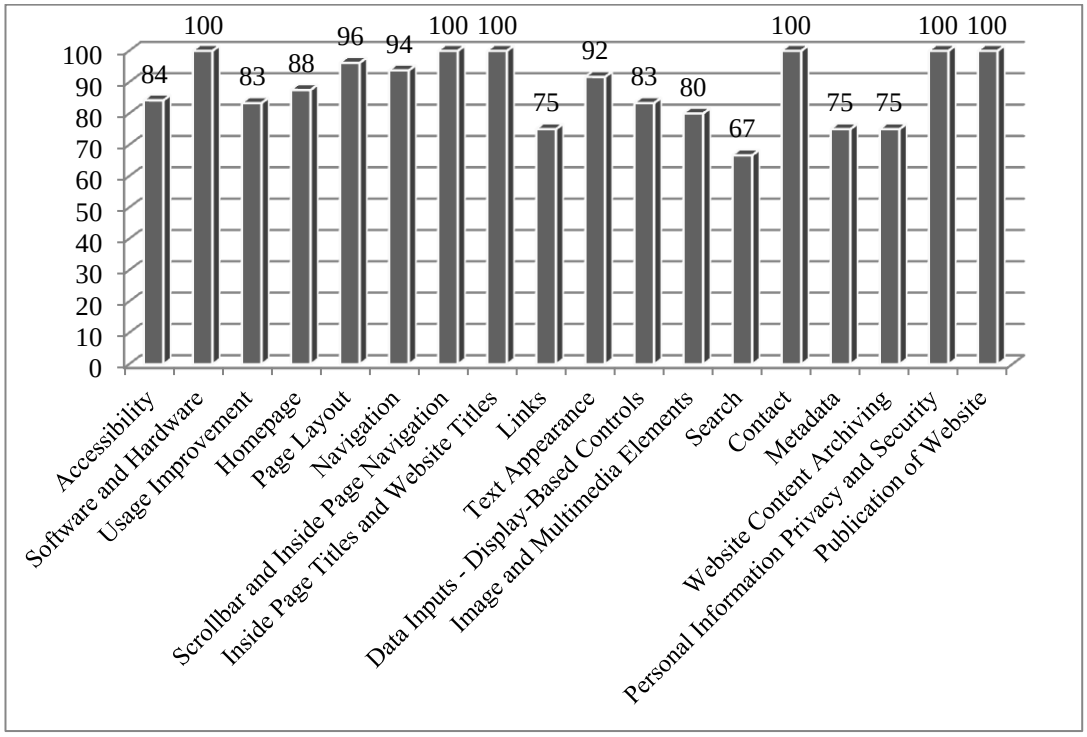

Figure B- 1 Turkey E-Government Gateway website evaluation result

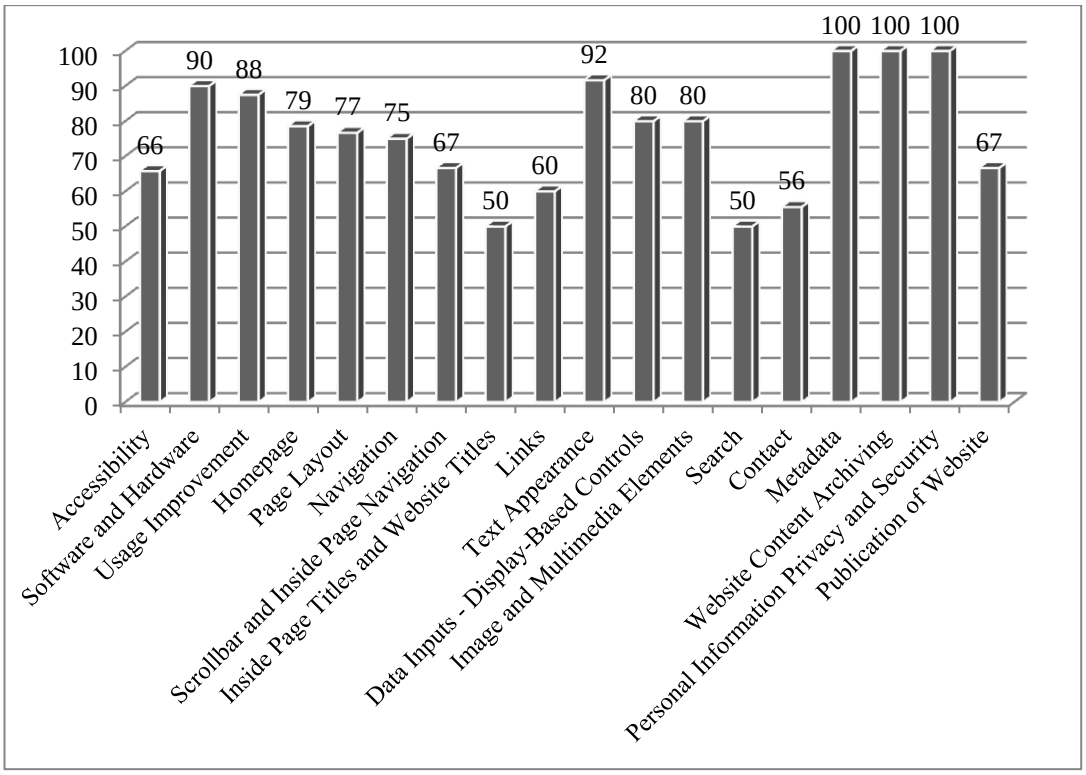

Figure B- 2 Ministry of Justice website evaluation result

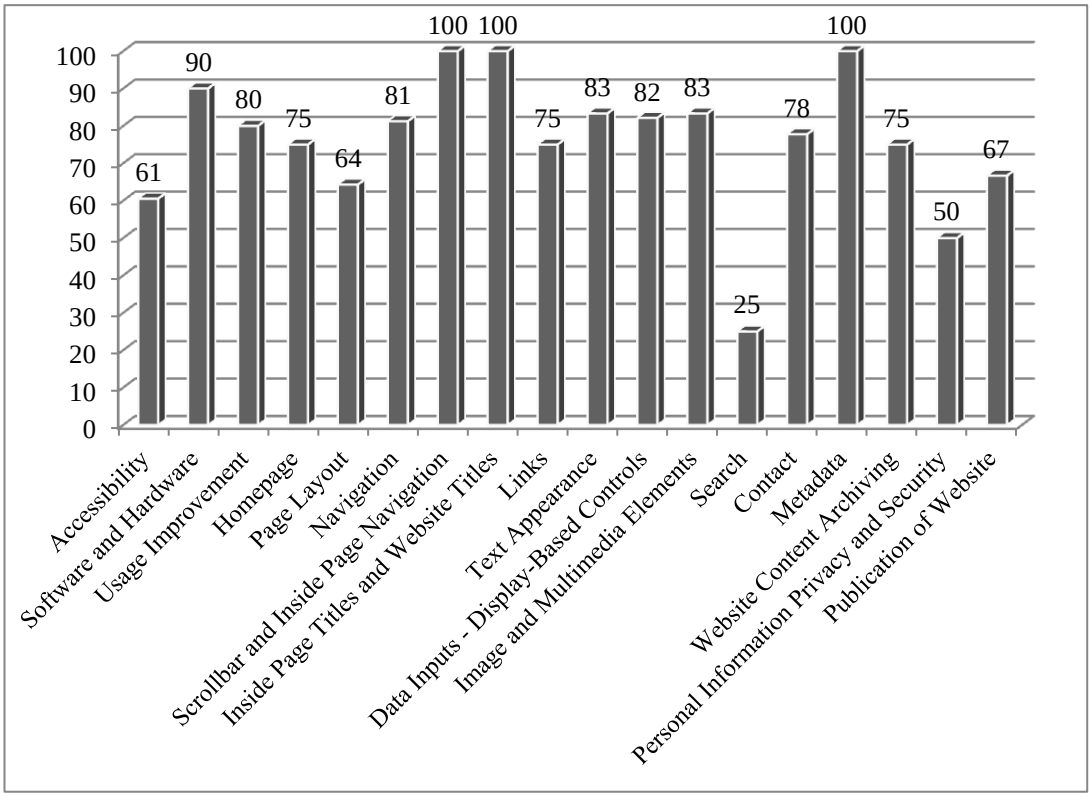

Figure B- 3 Prime Ministry of Turkey website evaluation result

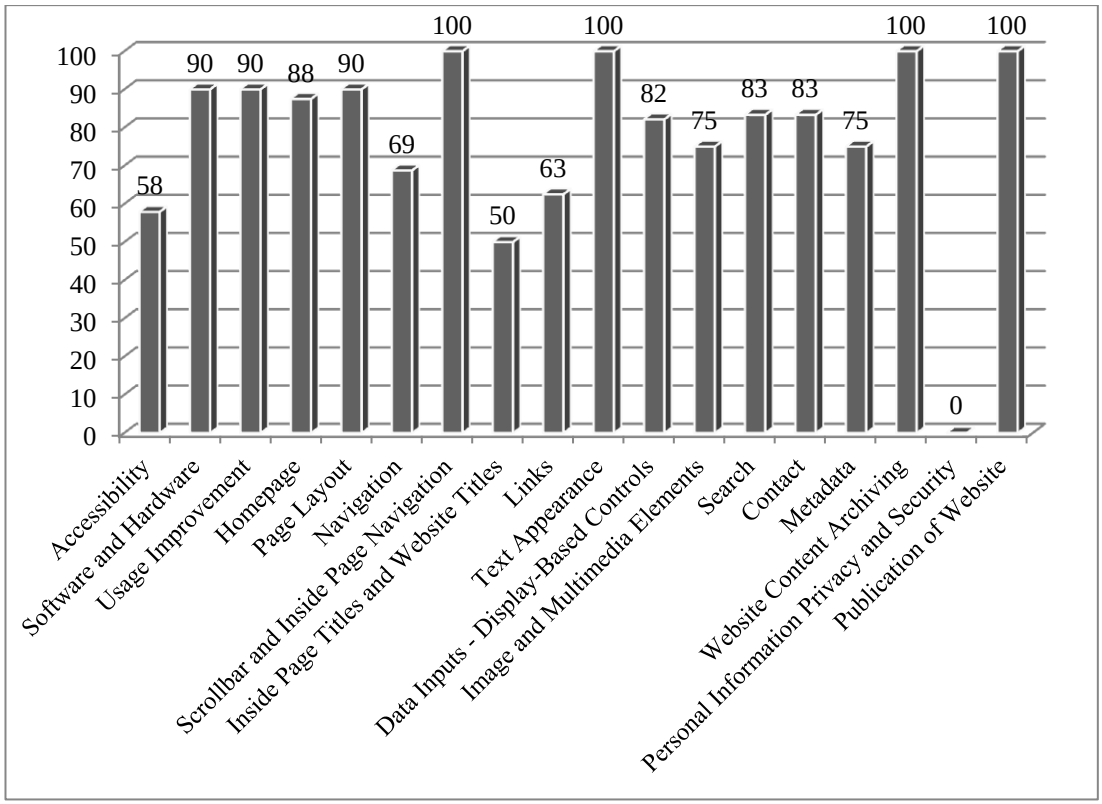

Figure B- 4 Ministry of Science, Industry and Tech. website evaluation result

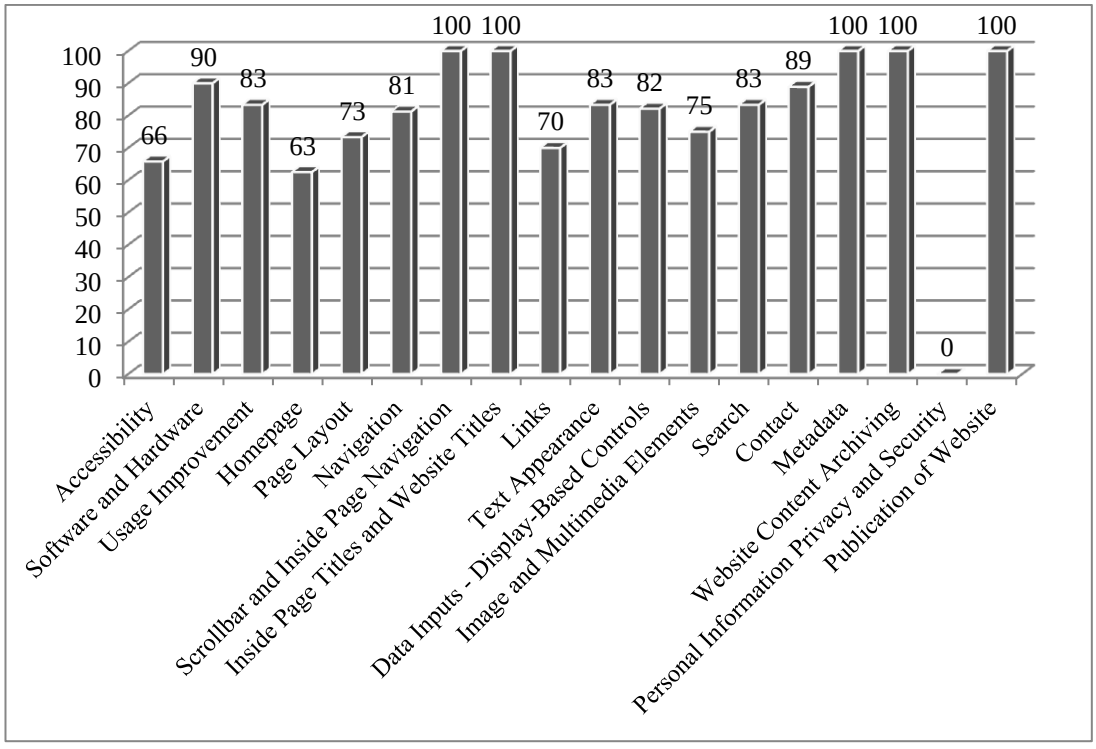

Figure B- 5 Presidency of the Republic of Turkey website evaluation result

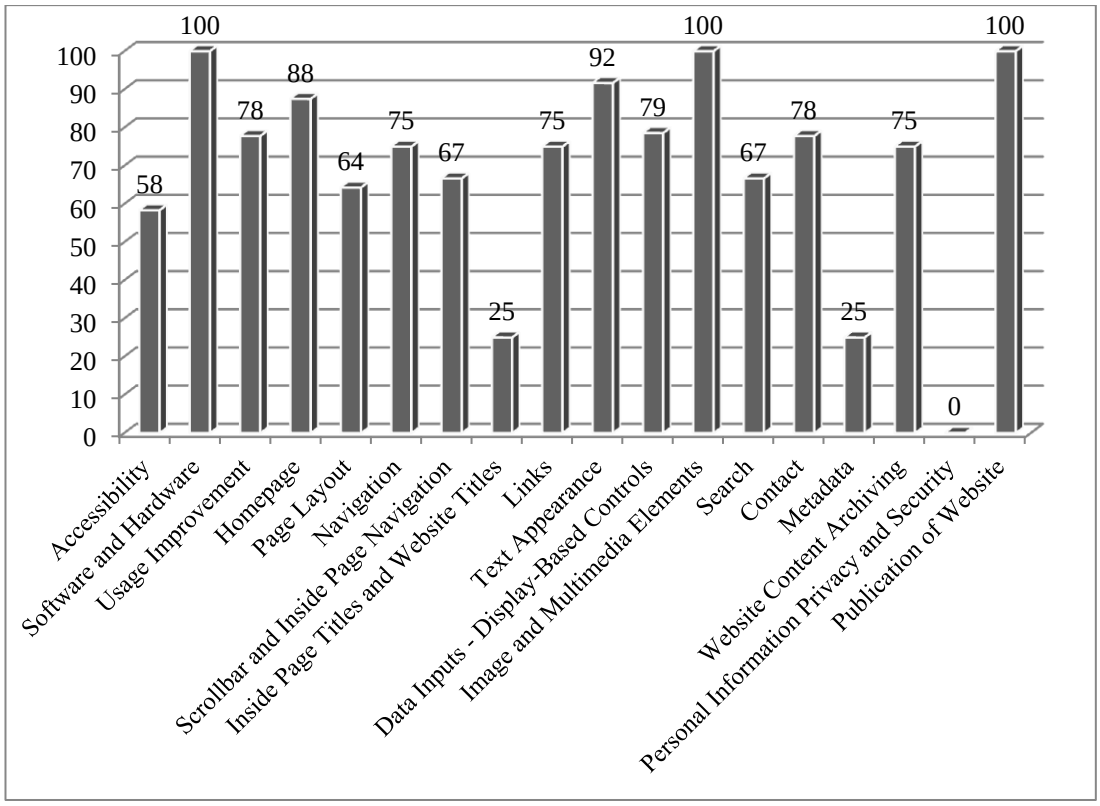

Figure B- 6 Ministry of Labor and Social Security website evaluation result

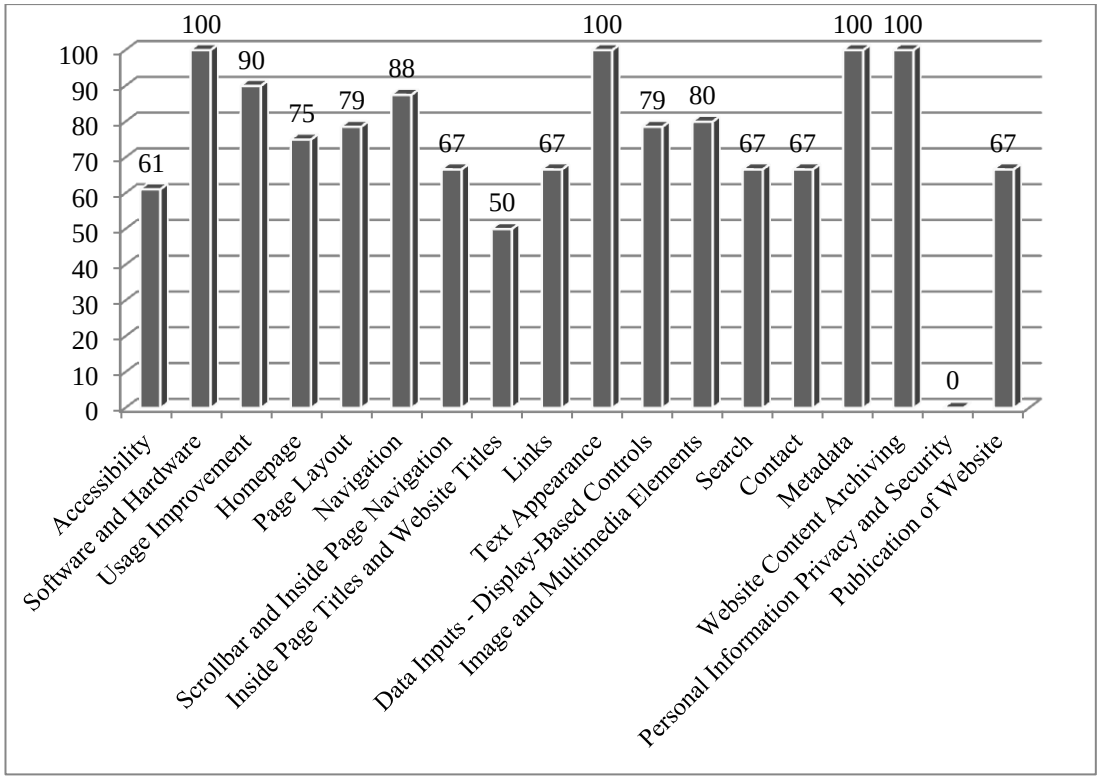

Figure B- 7 Ministry of Environment and Urbanism website evaluation result

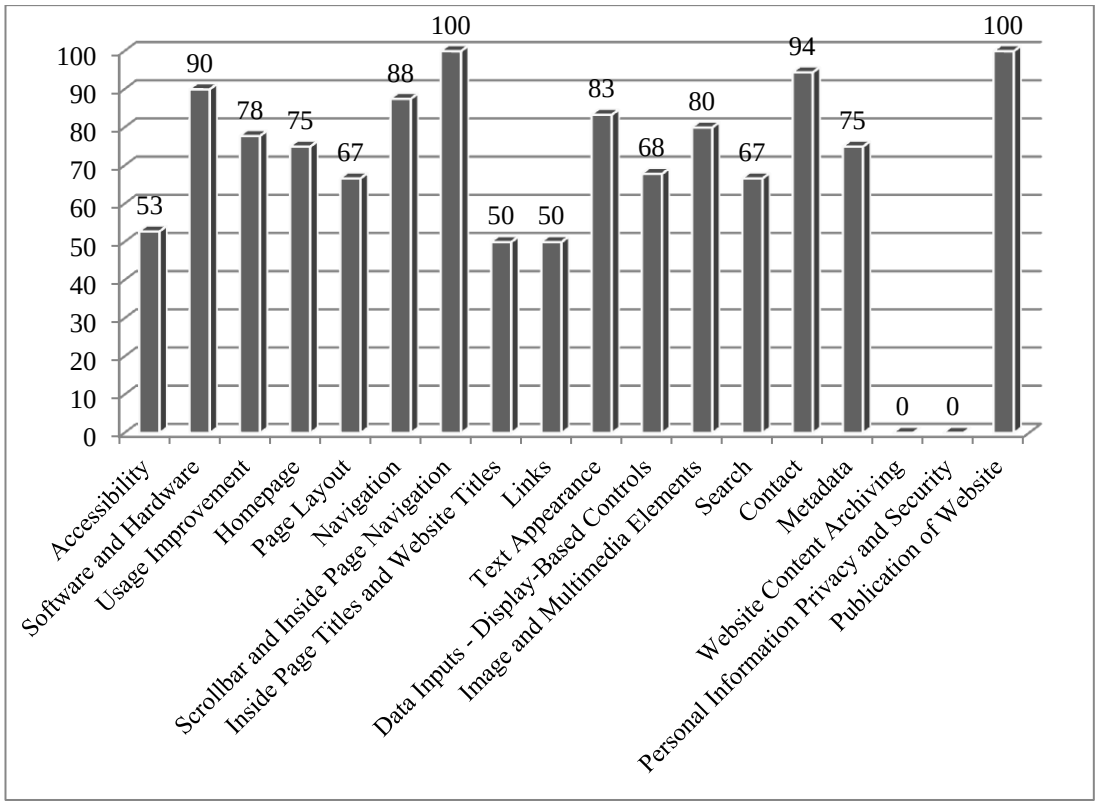

Figure B- 8 Undersecretariat of Maritime website evaluation result

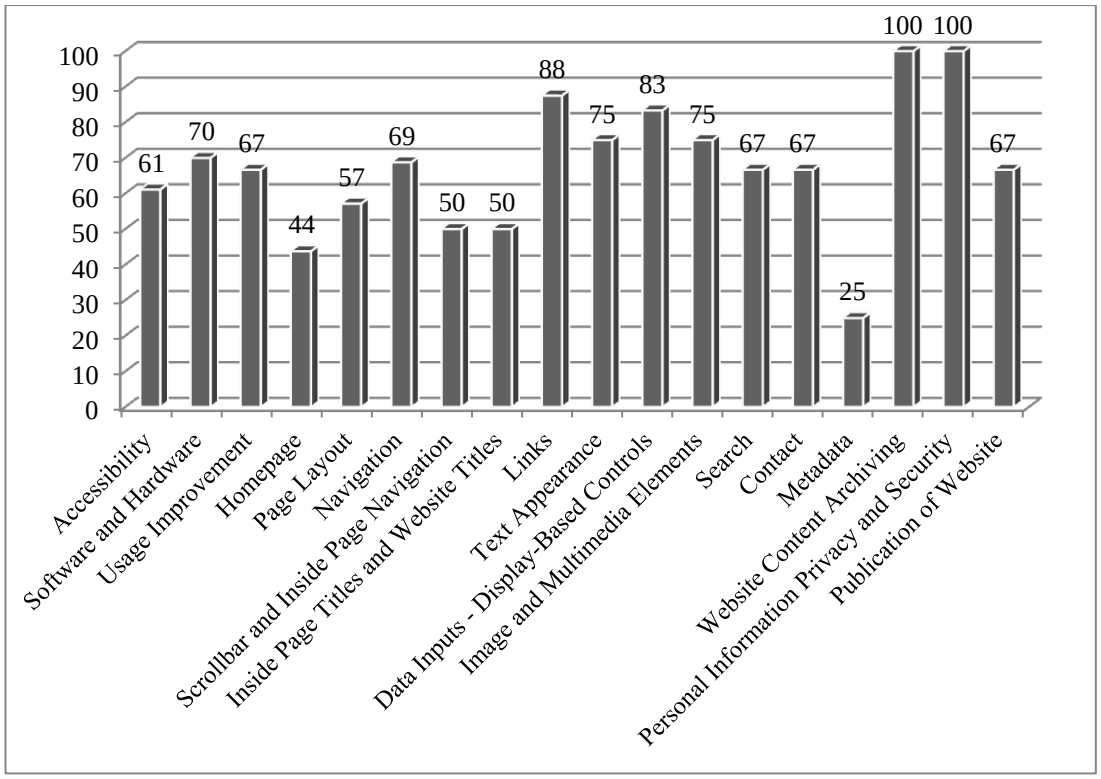

Figure B- 9 Government Achieves website evaluation result

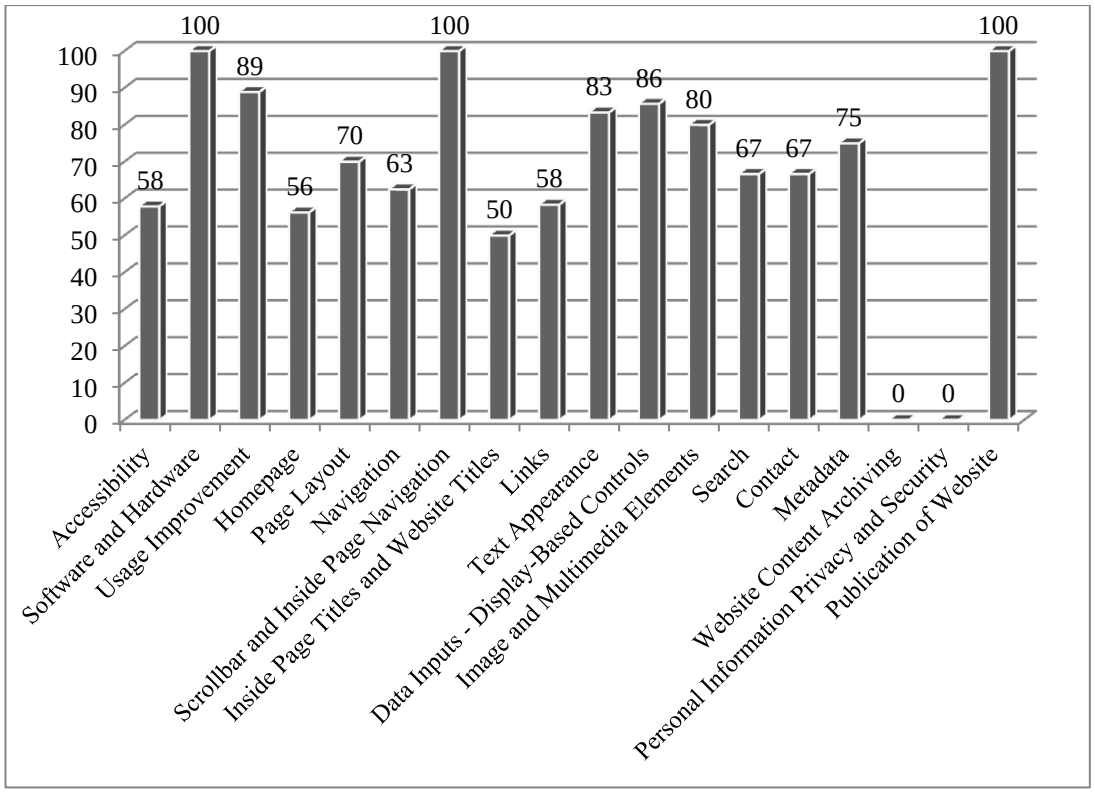

Figure B- 10 State Personnel Presidency website evaluation result

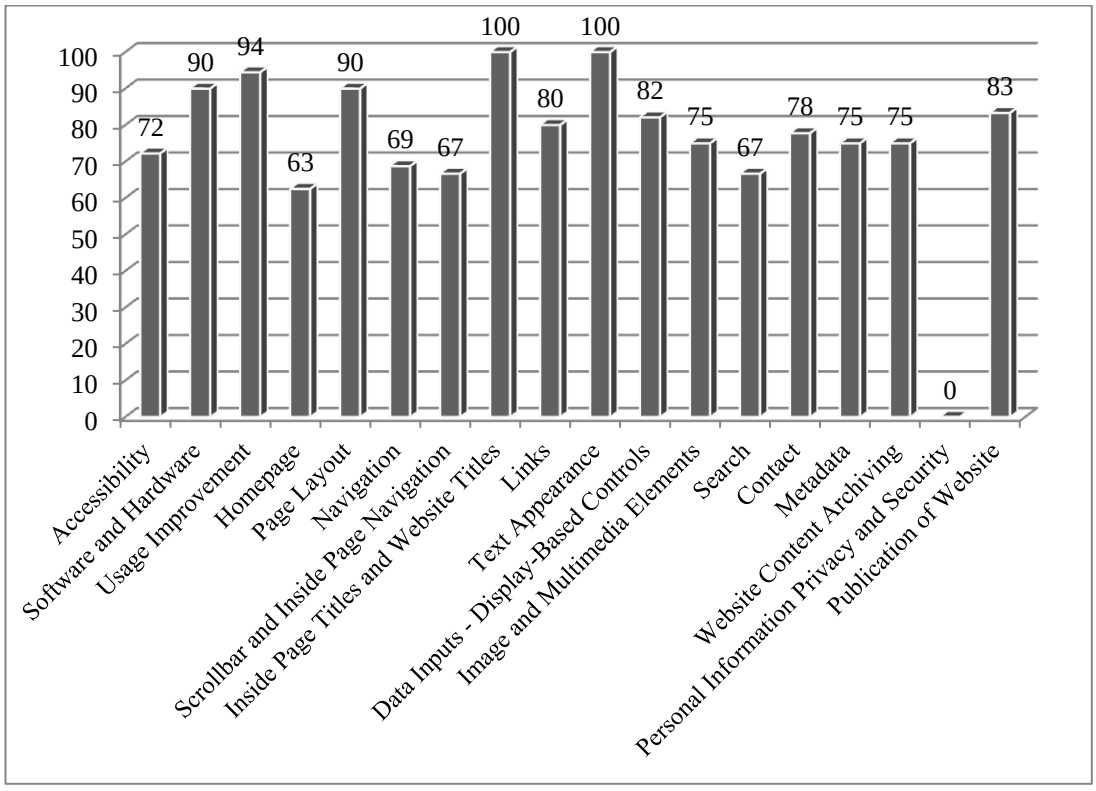

Figure B- 11 Ministry of Foreign Affairs website evaluation result

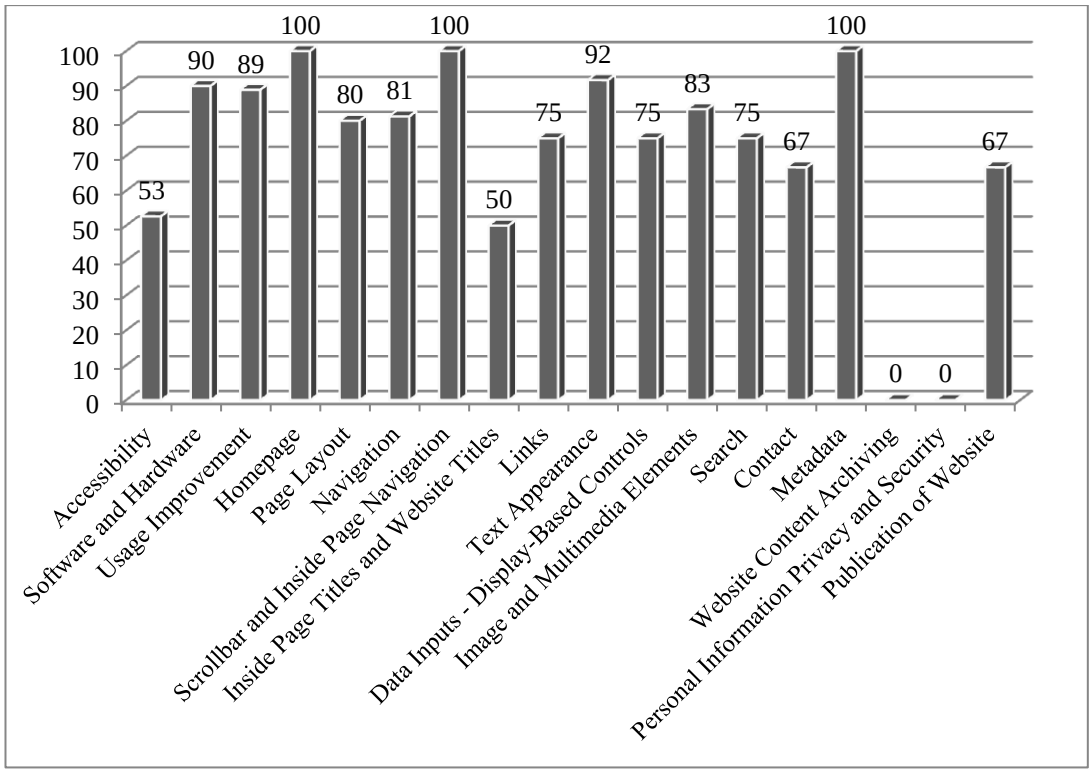

Figure B- 12 Presidency of Religious Affairs website evaluation result

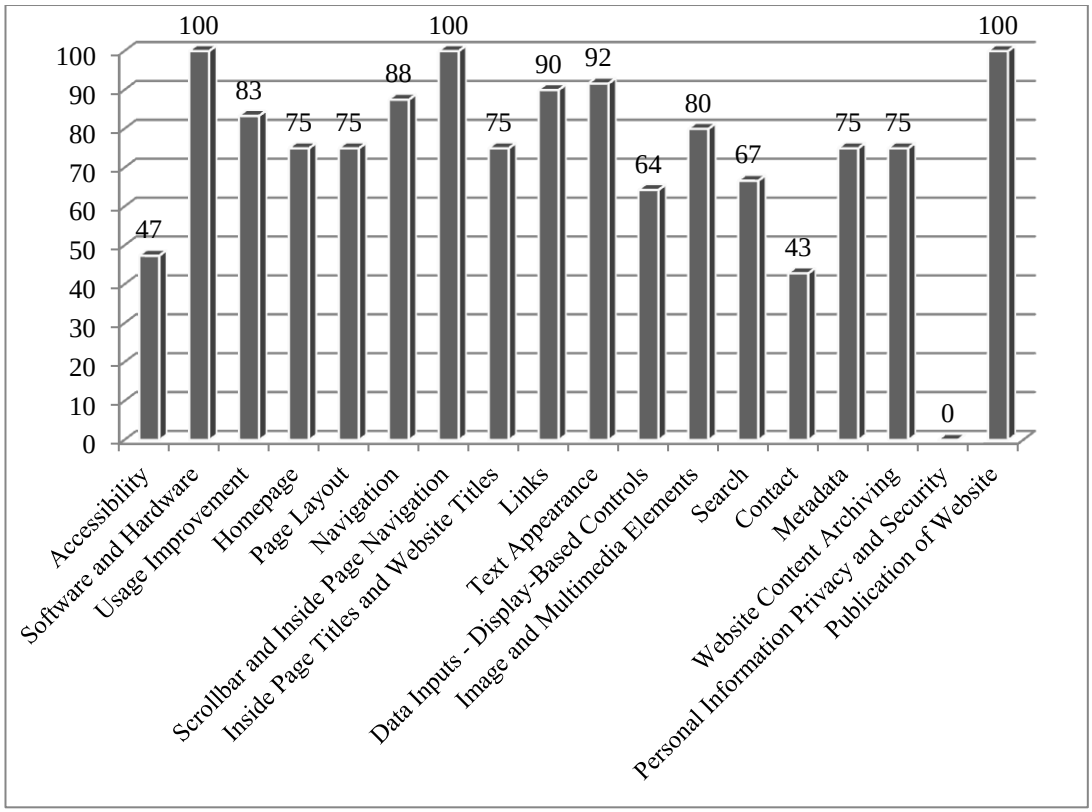

Figure B- 13 Ministry of Economy website evaluation result

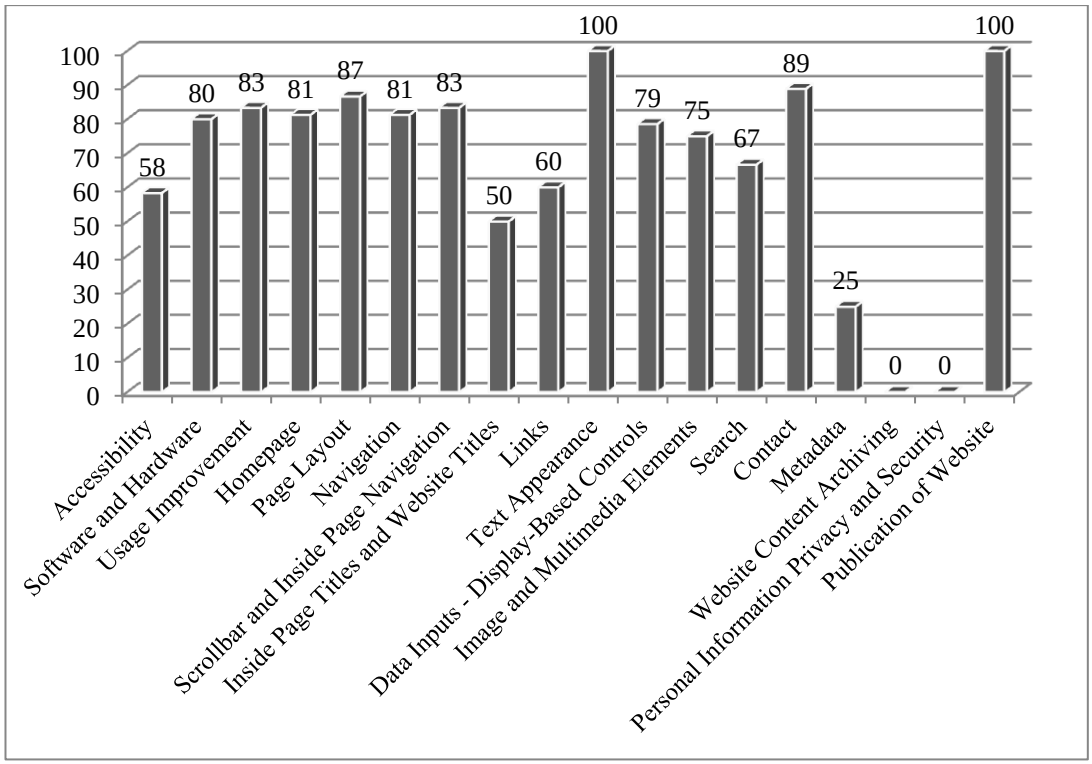

Figure B- 14 Turkish National Police website evaluation result

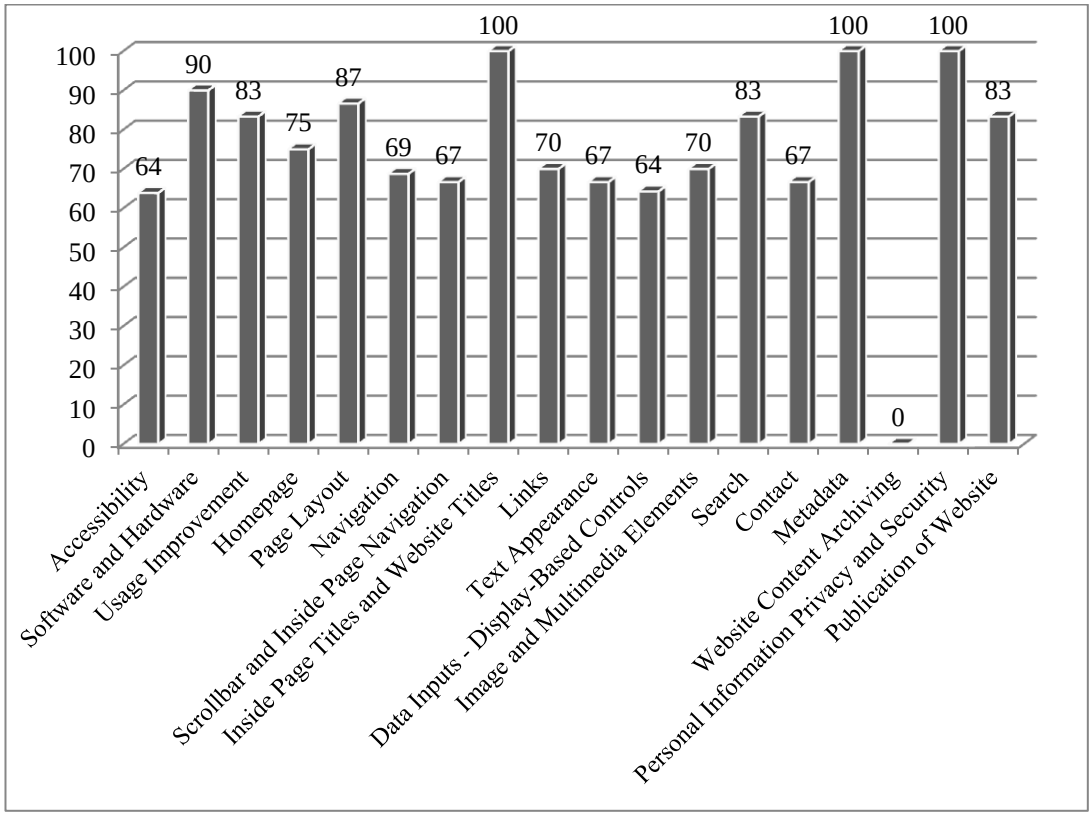

Figure B- 15 Revenue Administration website evaluation result

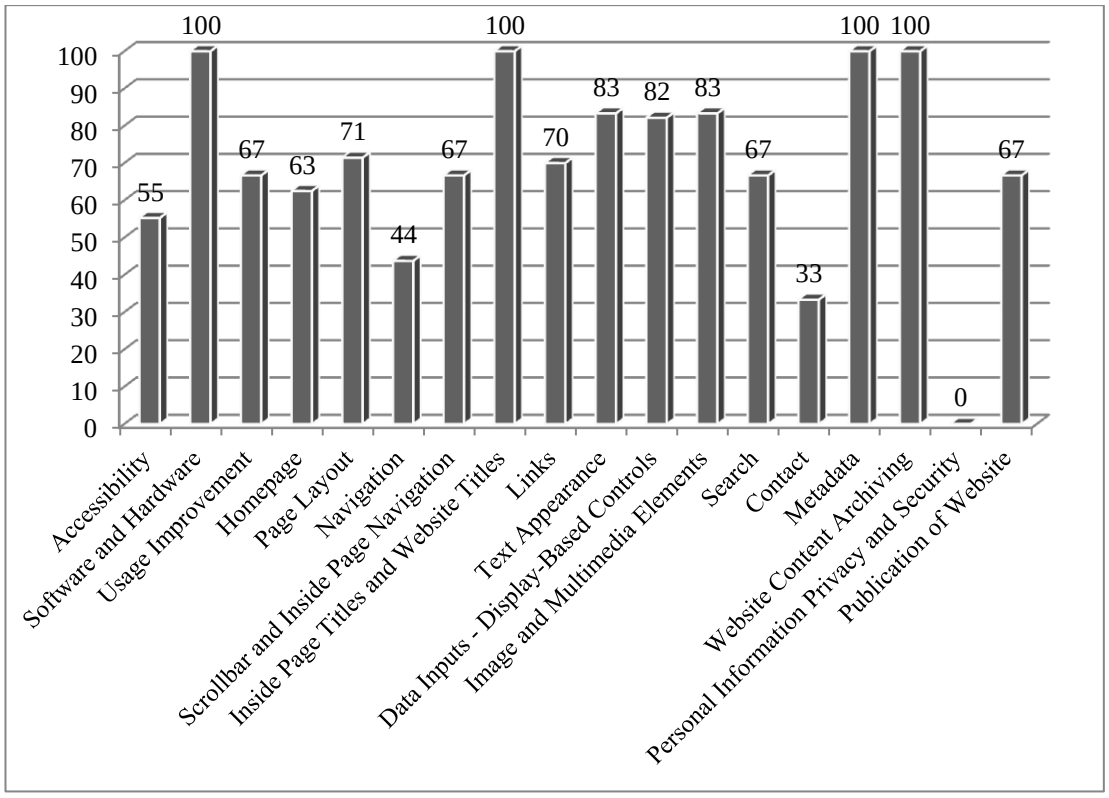

Figure B- 16 Ministry of Food, Agriculture & Stockbreeding website evaluation result

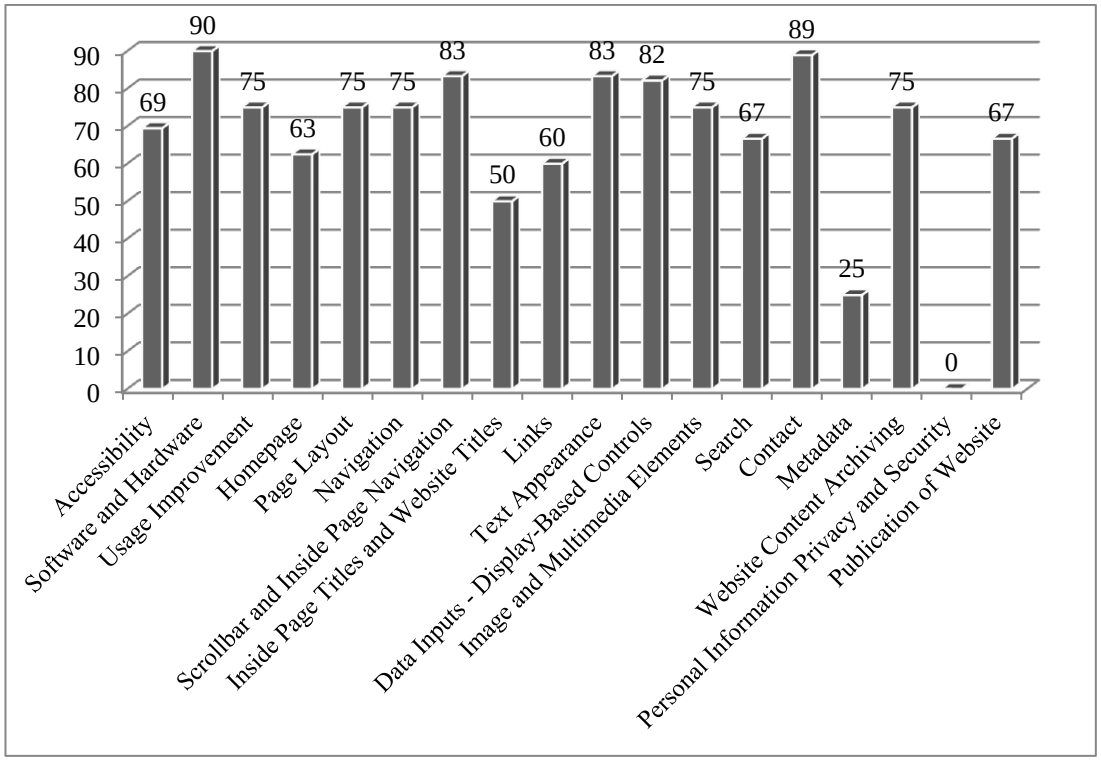

Figure B- 17 Ministry of Customs and Trade website evaluation result

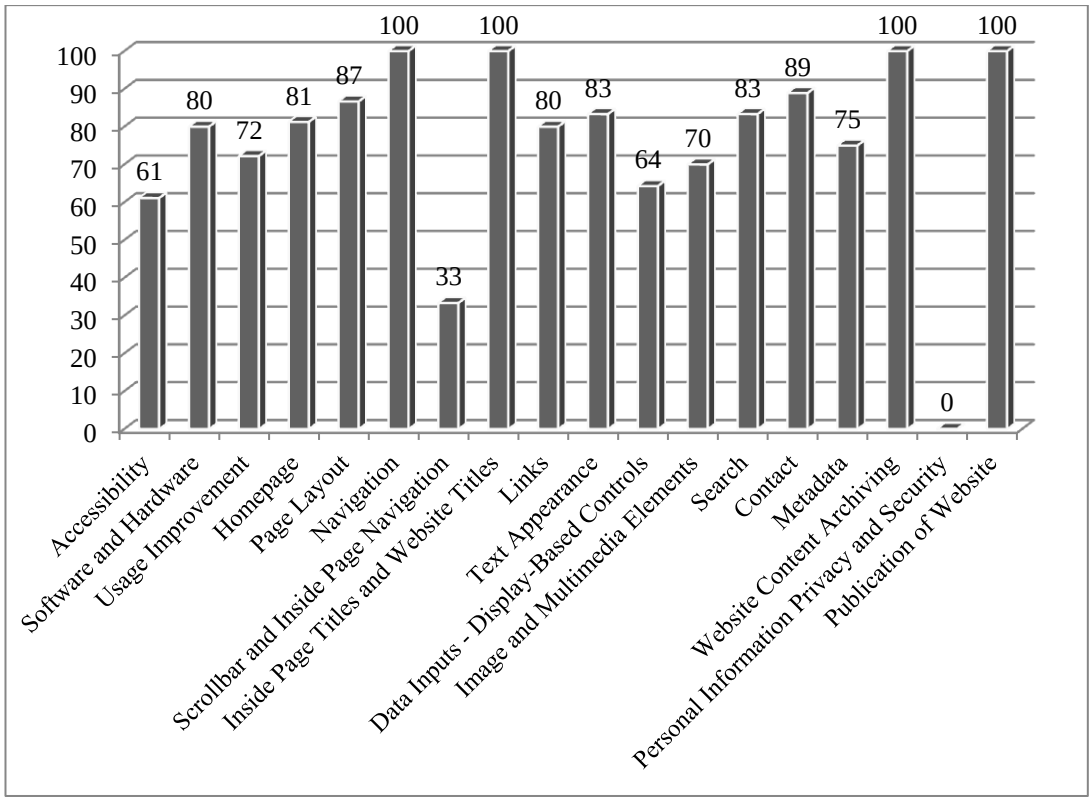

Figure B- 18 Undersecretariat of Treasury website evaluation result

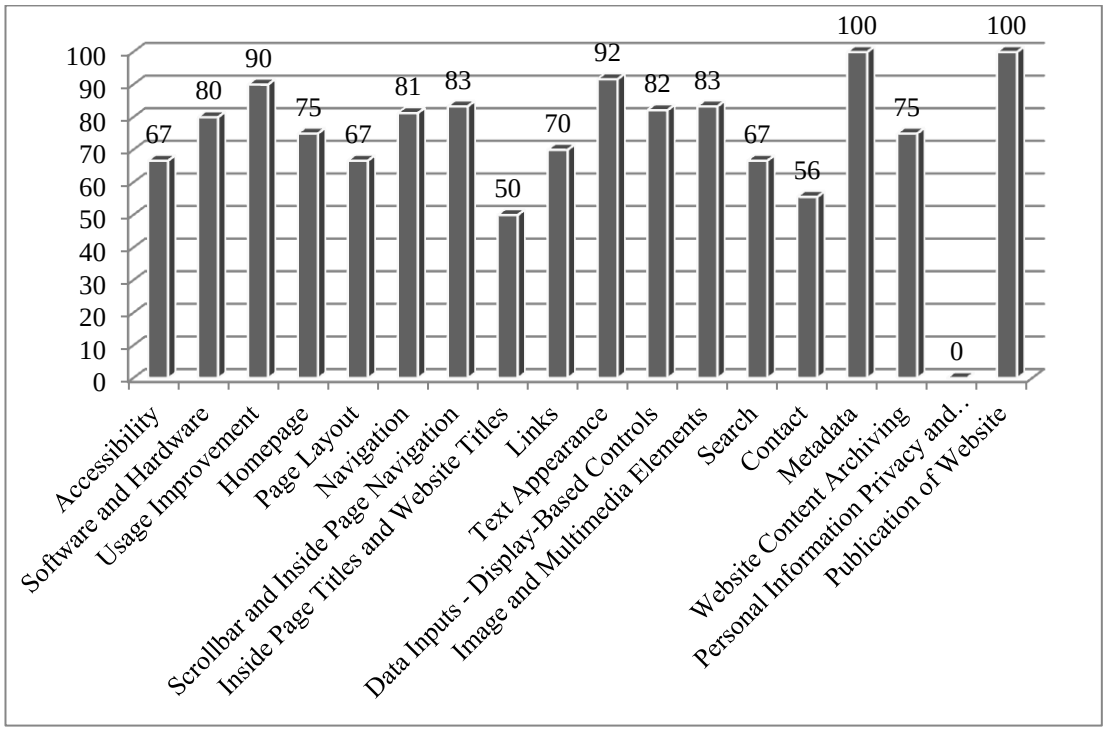

Figure B- 19 Ministry of Interior website evaluation result

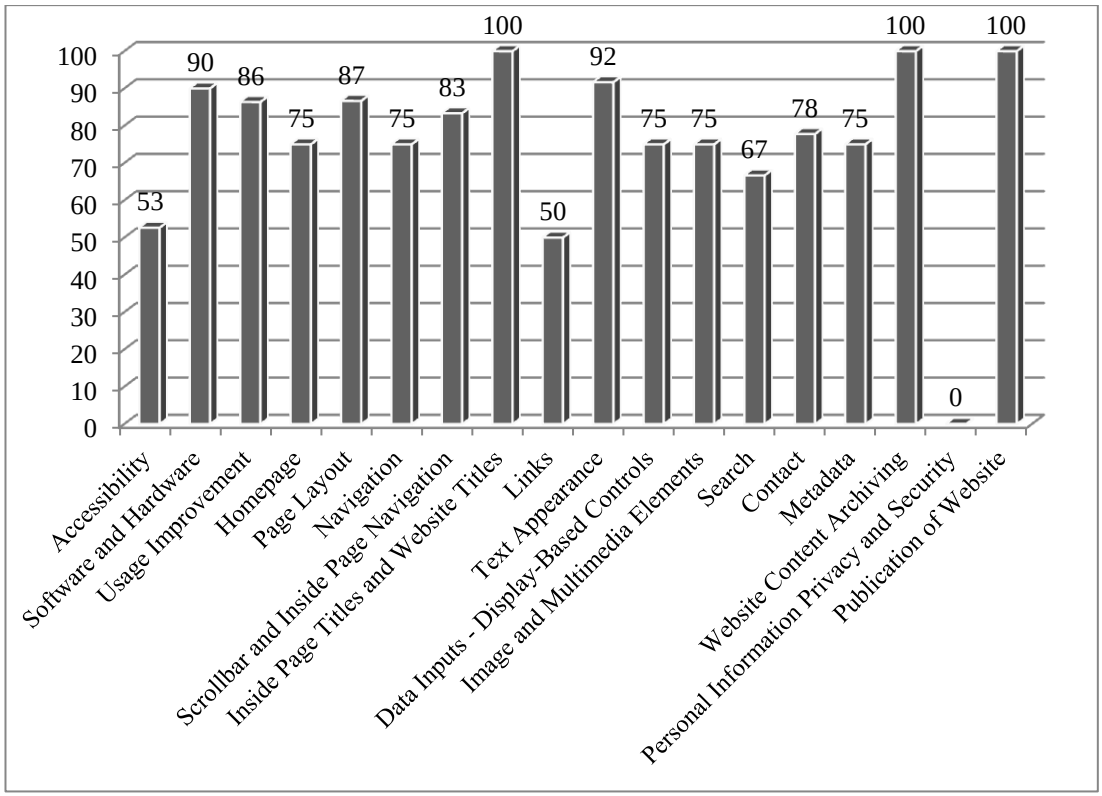

Figure B- 20 Ministry of Development website evaluation result

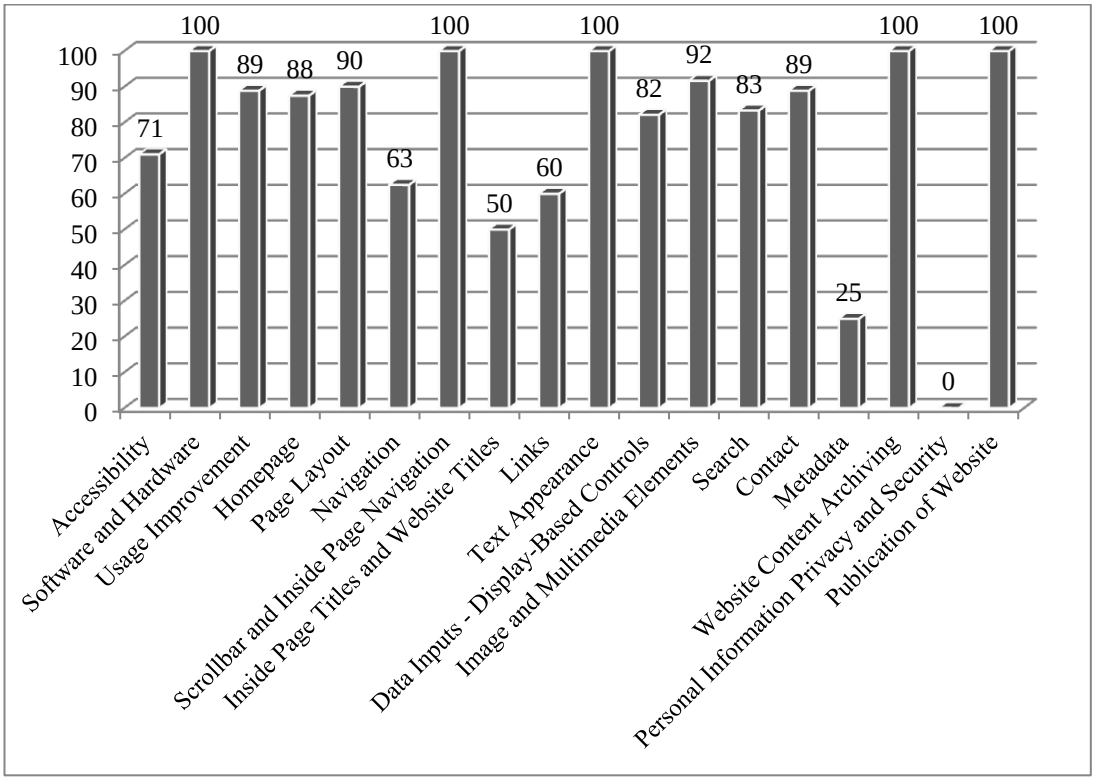

Figure B- 21 Ministry of Culture and Tourism website evaluation result

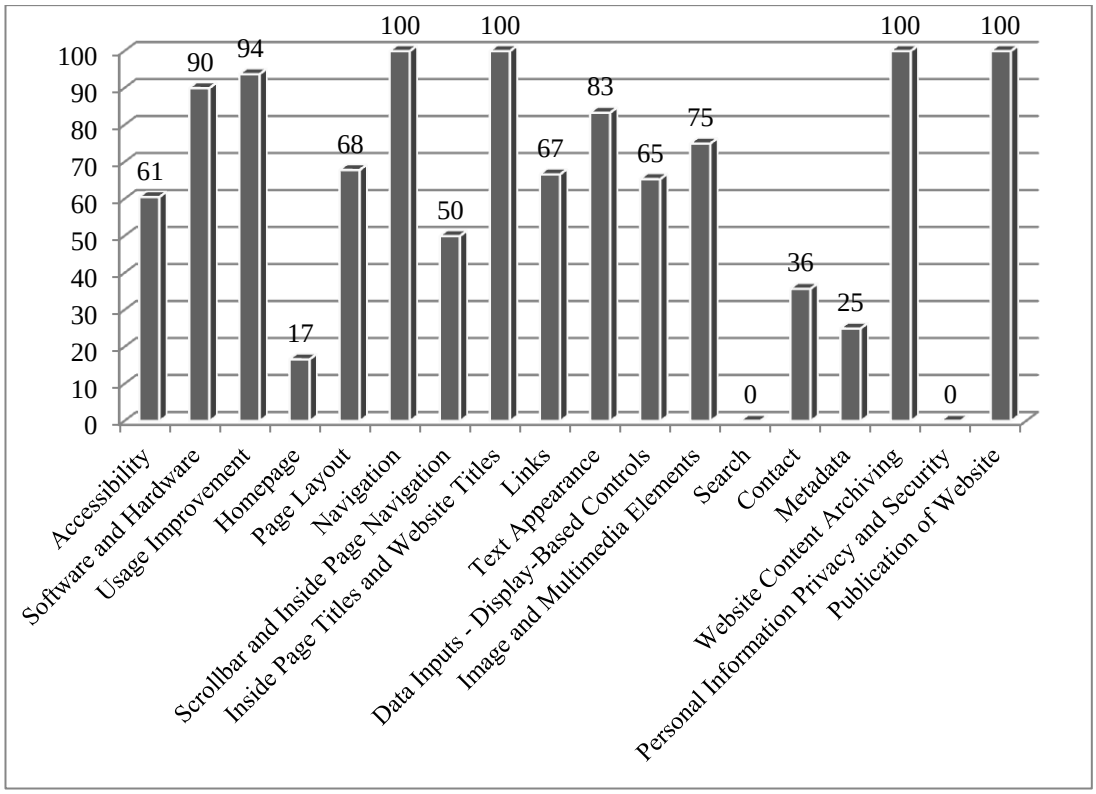

Figure B- 22 Ministry of Finance website evaluation result

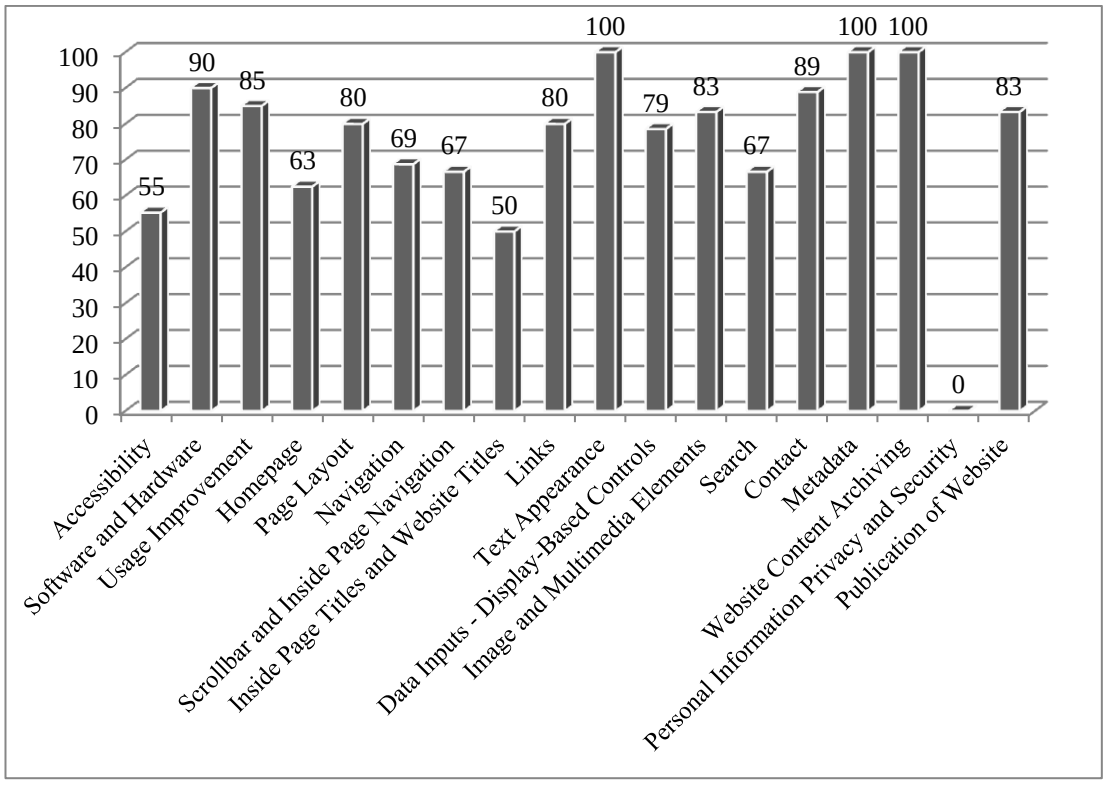

Figure B- 23 Ministry of National Education website evaluation result

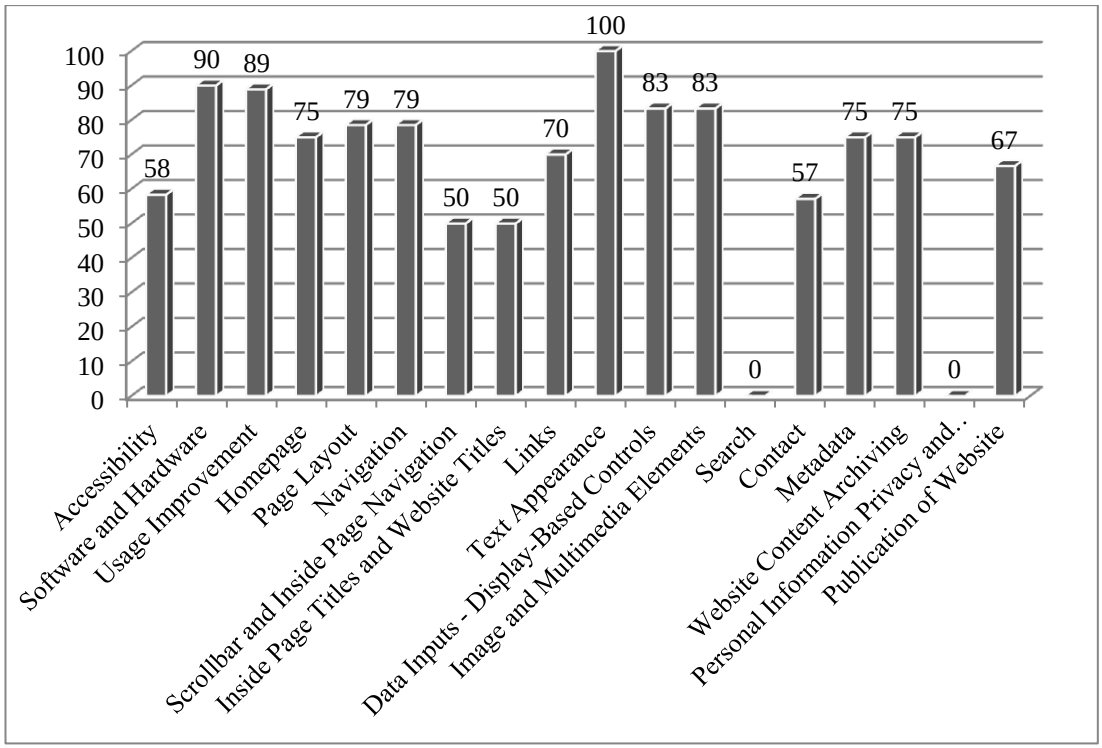

Figure B- 24 Ministry of National Defense website evaluation result

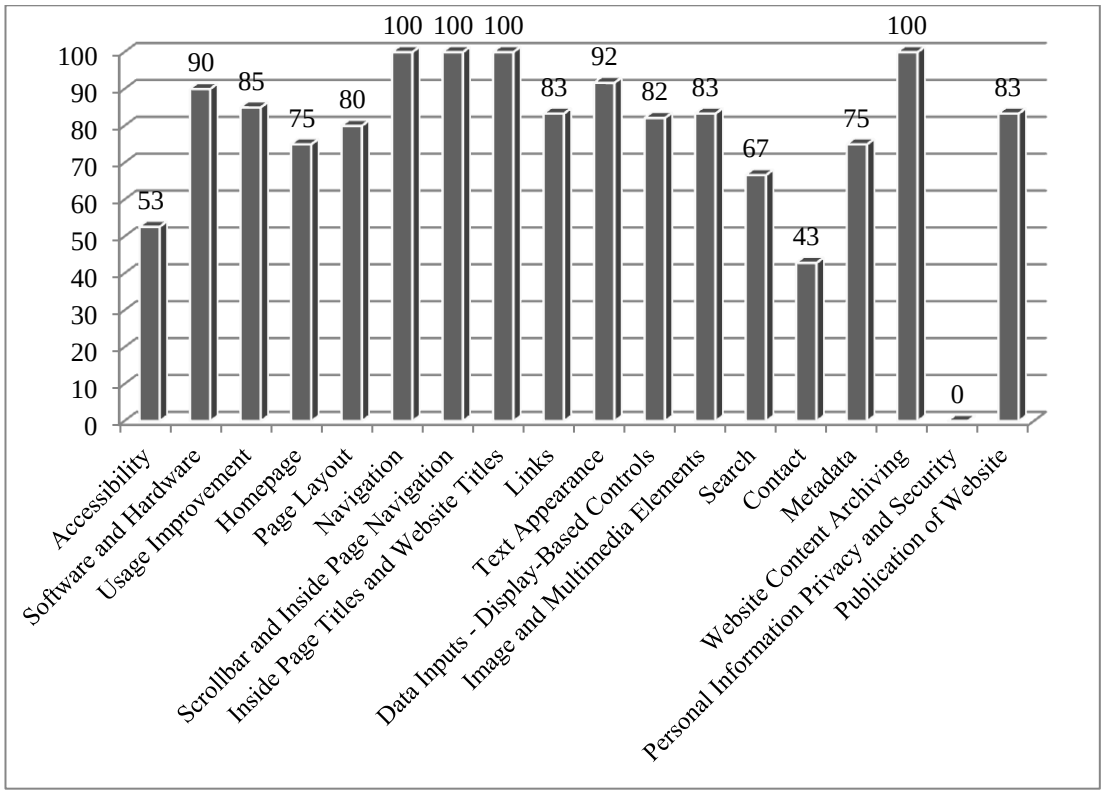

Figure B- 25 Ministry of Forestry and Water Affairs website evaluation result

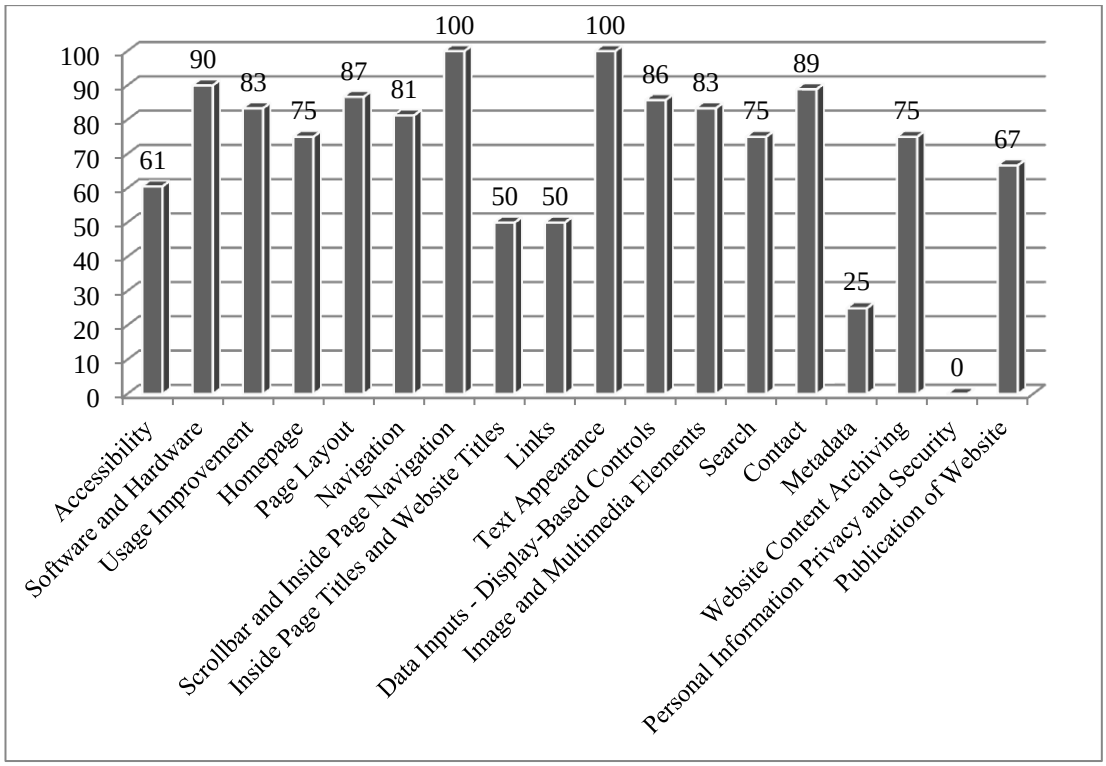

Figure B- 26 Ministry of Health website evaluation result

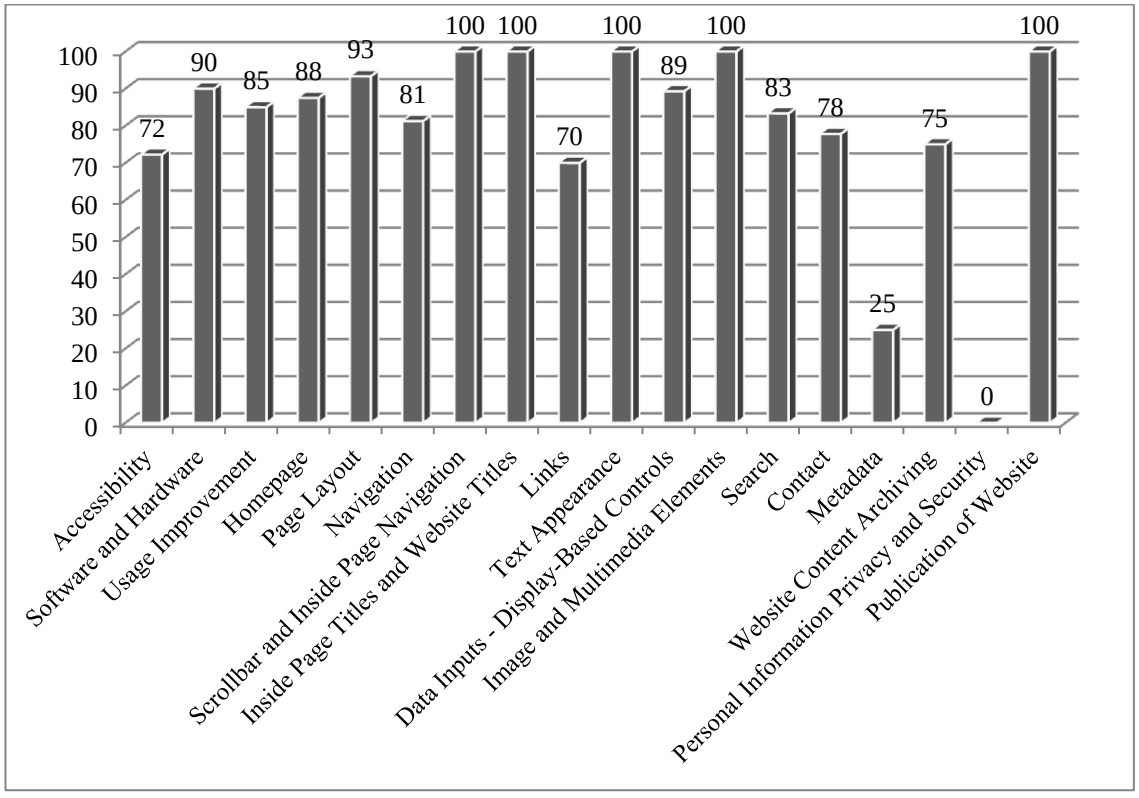

Figure B- 27 Social Security Institute evaluation result

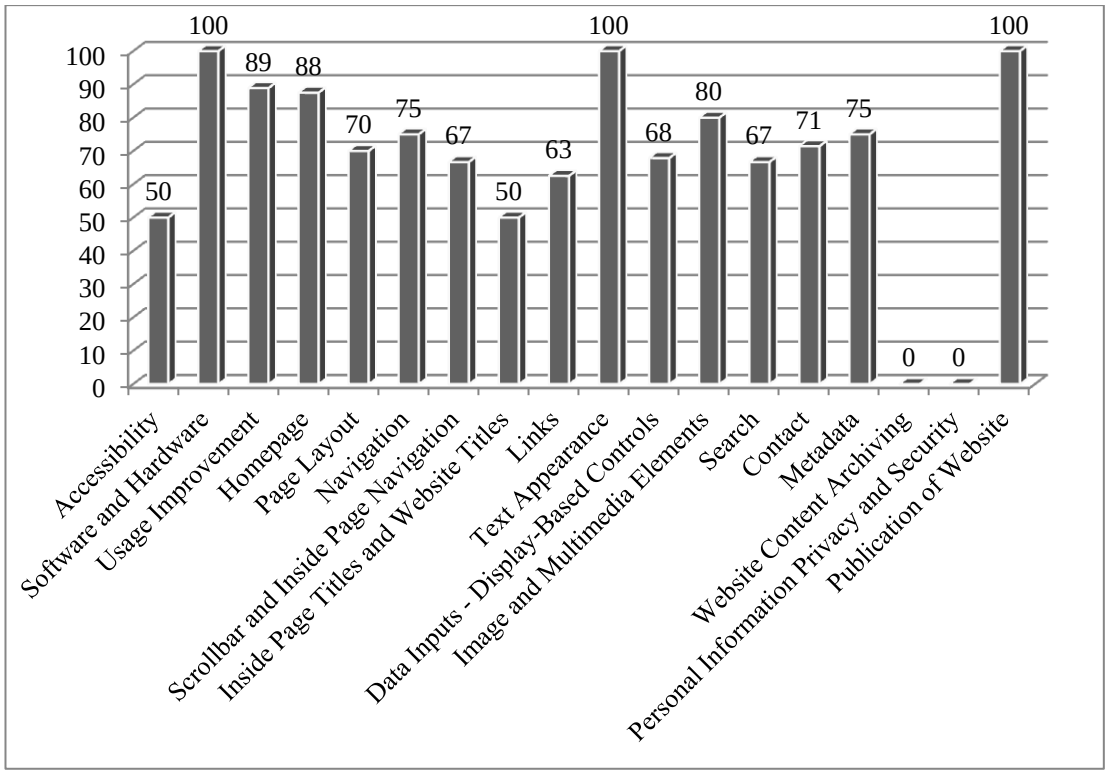

Figure B- 28 General Directorate of Land Registry and Cadastre evaluation result

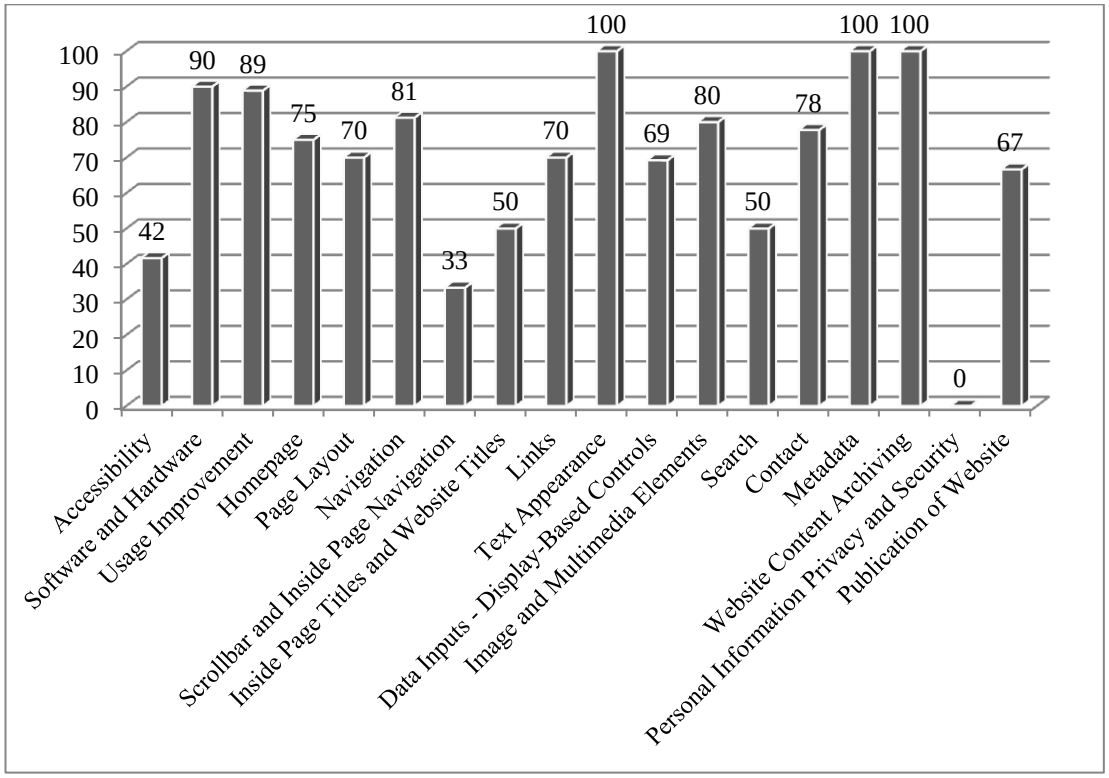

Figure B- 29 Grand National Assembly of Turkey evaluation result

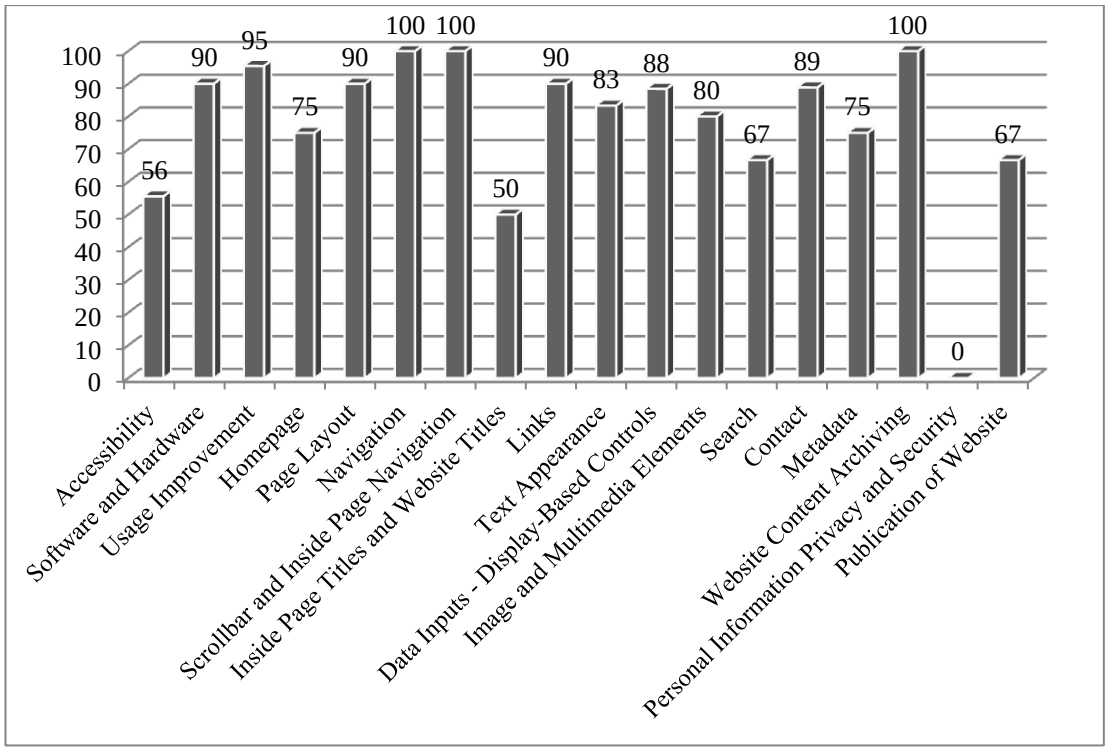

Figure B- 30 Turkish Statistic Institute evaluation result

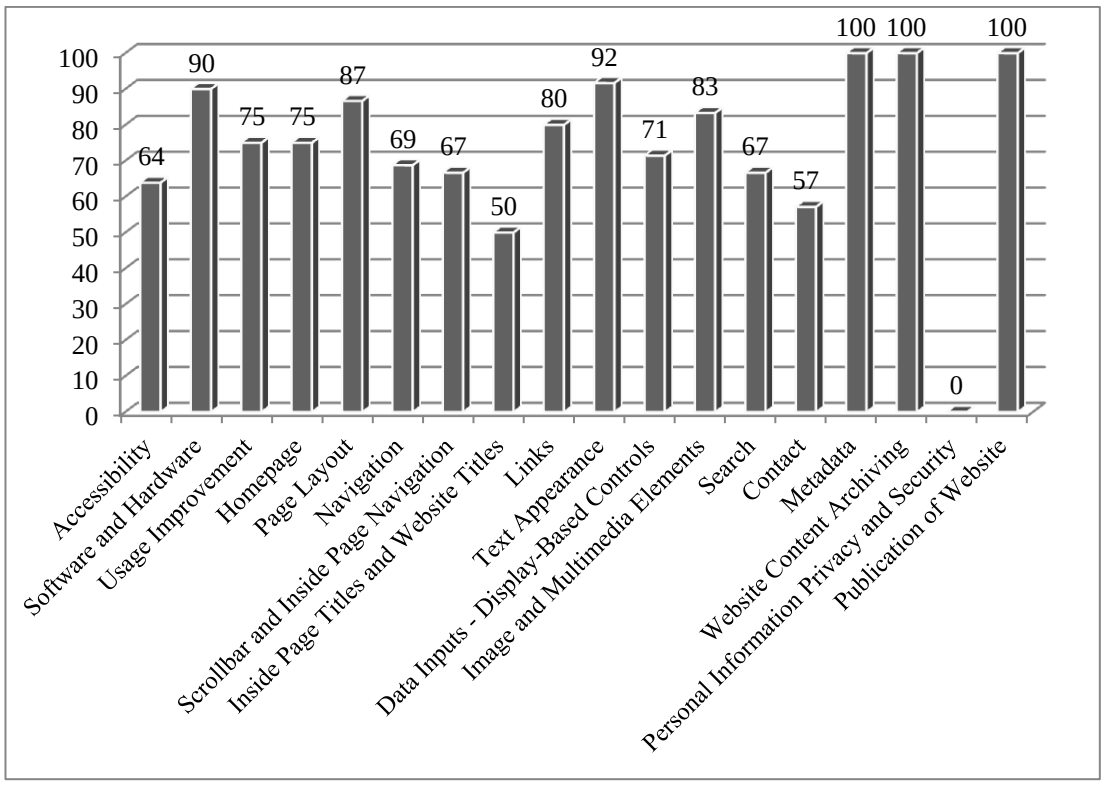

Figure B- 31 Ministry of Transmission, Marine & Comm. evaluation result

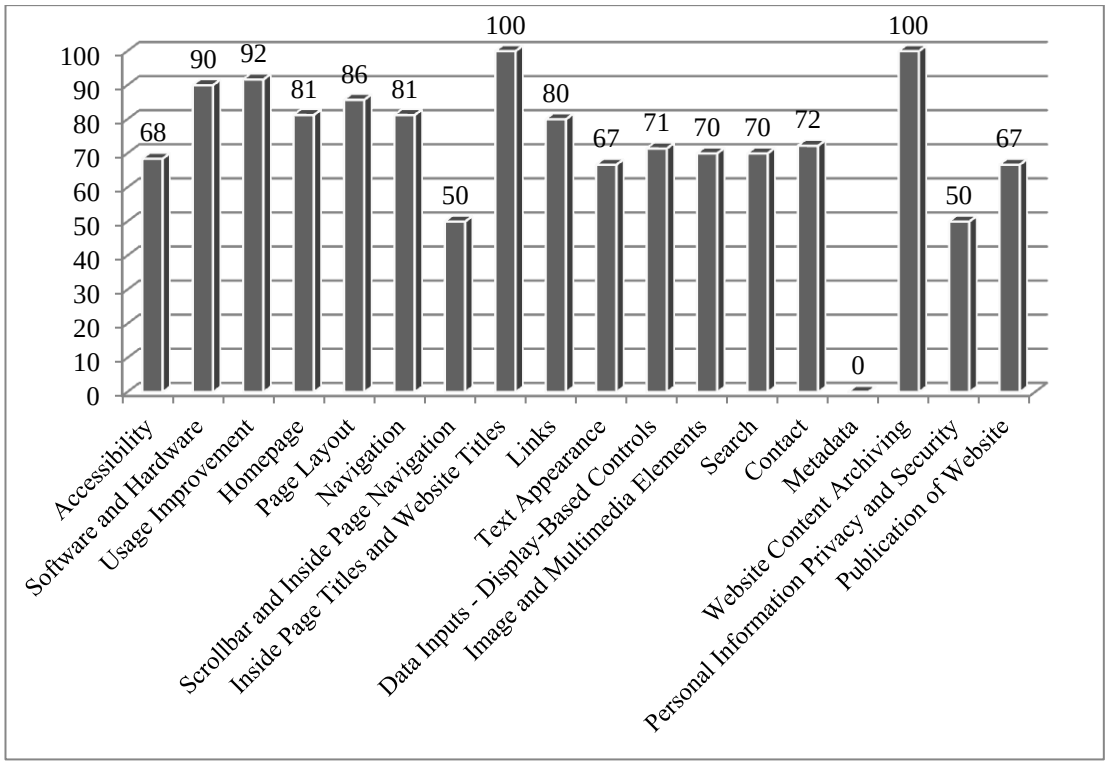

Figure B- 32 Turkey Labor Agency evaluation result

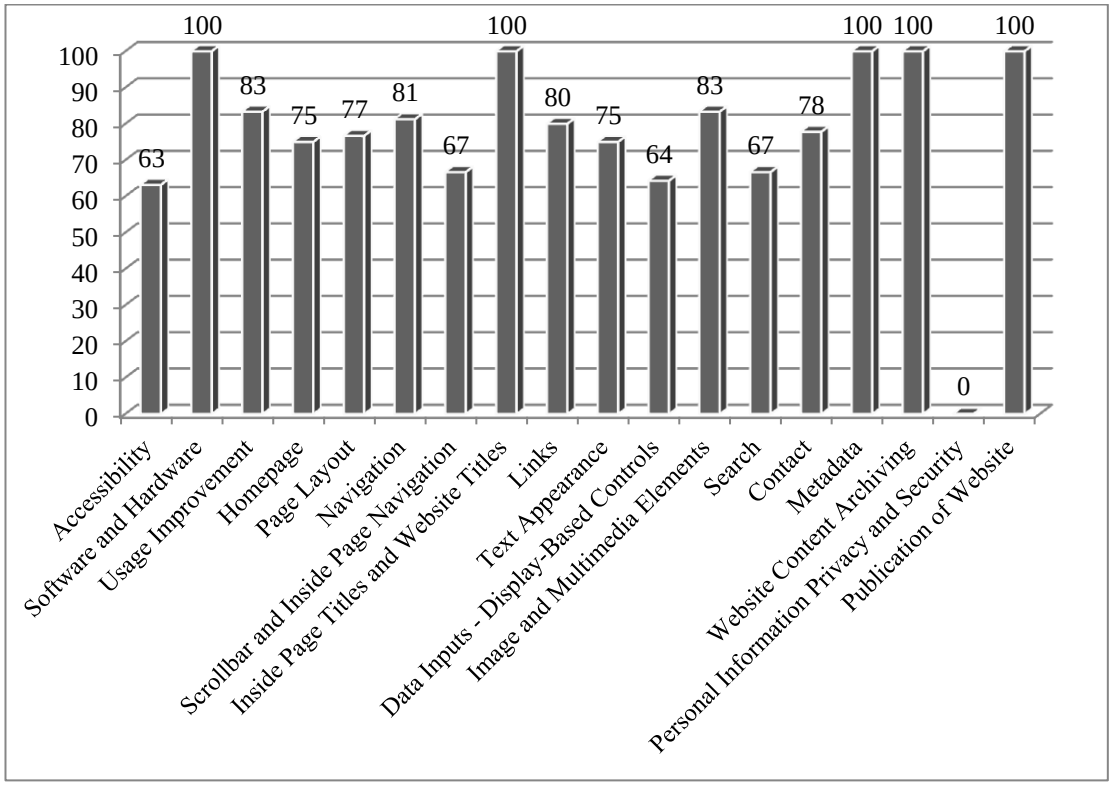

Figure B- 33 Meteorology General Directorate evaluation result

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı: DURMUŞ
Adı : Suna
Bölümü : Bilişim Sistemleri

TEZİN ADI (İngilizce): User-Centered Design Approach in E-Government Applications

TEZİN TÜRÜ : Yüksek Lisans ☒ Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐
3. **Tezimden bir bir (1) yıl süreyle fotokopi alınamaz.** ☒

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: **12.03.2012**