

RESEARCH, ANALYSIS, AND EVALUATION OF WEB ACCESSIBILITY FOR A SELECTED GROUP OF PUBLIC WEBSITES IN BULGARIA

Negoslav Sabev¹, Galya Georgieva-Tsaneva^{2*}, Galina Bogdanova³

¹Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Sofia,
Bulgaria

²Institute of Robotic, Bulgarian Academy of Sciences, Sofia, Bulgaria

³Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Sofia,
Bulgaria

*Corresponding author

² ORCID: orcid.org/0000-0001-8017-5537

³ ORCID: orcid.org/0000-0002-5463-4274

¹negoslavsabev@gmail.com

²galicaneva@abv.bg

³g.bogdanova@gmail.com

Abstract: This article discusses the accessibility of public information on the Internet by people with disabilities, and in particular people with visual deficits. Web accessibility standards, content and basic principles have been considered. A survey on the accessibility of public websites in the Republic of Bulgaria was conducted. Information on the group that conducted the study is given, the purpose of the study, the methodology of the study is described. The surveys were conducted on 100 public administration sites, which are divided into 5 groups. The results of the study are presented. Conclusions were made for the accessibility of information in the public sphere of the Republic of Bulgaria. In recent months accessibility of these sites has been re-evaluated. The results show that not enough is being done to achieve accessibility while maintaining public administration websites in Bulgaria. Despite the overall increase in web accessibility of the sites being

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

tested, there is still much work to be done on this. A statistical analysis of the different groups of public sites was conducted, and the group in which the accessibility was the best was examined. The conclusion is that the accessibility of the websites of the public administration in the Republic of Bulgaria is not at the necessary level of accessibility, which does not allow the users with visual disability to access these sites easily. It is, therefore, necessary for the public administration and web application developers to implement the accessibility guidelines proposed in the standards and improve the accessibility of these websites. This will be a step forward in ensuring the rights of people with disabilities. The paper of this survey is original and not previously published.

Keywords: People with disabilities, accessibility, public information, data analysis, web accessibility standards.

Introduction

The universality of the web implies universal access to the resources and opportunities it offers. It only needs to be connected to the global network and a variety of communication, education, information, commerce, work, and entertainment tools are available (Anctil, 2008; Kane, Shulman, Shockley, Ladner, et al., 2007).

The virtual environment on the Internet must be accessible to all its visitors and not discriminate against some users. Today, the worldwide information network is still not equally accessible to all its users. People with special needs face serious problems, barriers when trying to use the websites on the global network. This practice does not allow these people to read, manage, understand and create content. Typically, this group of users is categorized as "Disabled People (PD)".

The disability is temporarily or permanently difficulty or dysfunction of the body, sensors or cognitive processes. The disabilities are varied and

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

influence to varying degrees in everyday life of the individual in individual cases. Combinations between different types of disability are also possible, which further aggravates the functioning of the individual. ▫

There are several barriers that people with disabilities face in their desire to have a life like other people. According to a report of the World Health Organization and the World Bank since 2011, the total number of people with disabilities is 15 percent (World report on disability). It is not known globally what percentage of their total number are active Internet users, but they certainly experience practical difficulties and even the inability to use part of the web content. The reasons for this can be found in the lack of information about the problem, as well as in the lack of awareness of the web accessibility standards. In any case, the primary reason is how the information is located on public sites. Access to this information should meet the needs and expectations of people with disabilities (Rahmatizadeh & Valizadeh-Haghi, 2018). People with disabilities use the Internet with appropriate access tools (Kurt, 2011).

Public web sites contain interesting information for people, useful data and up-to-date information. Accessibility of people with disabilities to public web sites should be organized so that people with disabilities can easily use it.

Creating friendly set up sites for people with disabilities is a difficult task because people do not have equal experience and the same ability to work with sites (Lee & Koubek, 2010).

Background

Today, there is an increase in the number of people with disabilities who want to actively use information in the World Wide Web (Harrison, Barlow, & Williams, 2007). It is therefore important that the accessibility of public websites is of a sufficiently high level and that persons with disabilities can easily and conveniently access the information in them. When an

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

organization does not take into account the need for people with disabilities to use its services, it does not take them into account as part of its users and does not seek to provide them with access (Wegge & Zimmerman, 2007). Website accessibility research shows no good results for the use of sites by disabled people (Hassouna, Sahari, Ismail, 2017). Therefore, website designers should begin to comply with the accessibility guidelines set out in the relevant standards, not just ensure the quality and information security of the sites (Cocquebert, Trentesaux, & Tahon, 2010).

In their study, Bradbard & Peters (2010) review current author studies on accessibility to the World Wide Web, review tools for creating and evaluating website accessibility, and provide practical tips for making university websites accessible.

Evaluating the accessibility of a website is a difficult task, each website is designed in a specific way, and disabled users may encounter various difficulties (Lee & Koubek, 2010).

Guided by the goal of contributing to improving the accessibility of information on the worldwide network of young people with disabilities who want to get a good education, many studies have evaluated the accessibility of university websites (Solovieva, Bock 2014; Ringlaben, 2014; Maisak, 2015, Nir, 2018; Stitz, & Blundell, 2018).

Kurt (2011) surveyed accessibility levels of Turkish University's home pages, which found that accessibility guidelines were not followed; the author makes recommendations for improving accessibility. In 2015, the survey was repeated and found that overall the accessibility of the pages studied was not improved (Kurt, 2017). The most common omission is to provide equivalent text alternatives for content.

In their research, Thompson, Comden, Ferguson, Burgstahler & Moore (2013) conduct a semi-automated web search for web / IT accessibility policies in higher education universities in the USA. The survey found that accessibility

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

was different across sites, finding an alternative text for the images. 8.4% of universities apply the principles of accessibility. The websites of self-contained institutions provide a higher degree of accessibility. The study found that university websites in the United States were not sufficiently accessible.

Web Accessibility Standards

The type and degree of disability determine the nature of the problems people with disabilities encounter on the Internet. Web Accessibility Standards are aiming to get acquainted all interested in the problems, related to people with disabilities, and addressing the needs of individuals, organizations, and governments on an international scale (Web Content Accessibility Guidelines).

The most widely accepted standard for Web accessibility is the Web Content Accessibility Guidelines (WCAG). The current version at the moment is 2.1. The standard is produced under the leadership and with the active involvement of the World Wide Web Consortium (W3C). Essentially, it is a robust, explanatory technical standard. At the same time, it is technologically independent, i.e. different technologies can be used to implement it.

The WCAG 2.1 standard contains many recommendations for creating more accessible web content. The implementation of these guidelines should make web content more accessible to a wide range of people with disabilities, People with blindness and low vision, deafness and hearing loss, learning difficulties, cognitive limitations, reduced mobility, speech problems, photosensitivity and various combinations of them (Web Content Accessibility Guidelines). The purpose of these recommendations is to make web content more user-friendly.

The WCAG 2.1 standard is a set of recommendations for achieving more accessible web content. Following these guidelines, the content will be more

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

accessible to people with different types of disabilities such as blindness and low vision; deafness and hearing loss; mental disabilities; cognitive limitations; restricted movement; speech impairment; photosensitivity, and others. By following these guidelines, usually, the web content will be more usable for users. From 2012 the current version at that time WCAG 2.0 is an ISO standard (ISO/IEC 40500:2012).

Web Content Accessibility Guidelines 2.1 is the official standard of the 5th of June 2018 (WAC Recommendation, the 05th of June 2018). The version WCAG 2.1 builds up WCAG 2.0. The latest accessibility standard chain created builds on and is compatible with previous versions; it was created to help improve accessibility for disabled users' sites. The 17 new Success Criteria have been added to help mobile users with a disability; individuals with low vision; individuals with cognitive or educational disabilities; Speech-to-Text software users.

Contents of WCAG 2.1 standard

The standard is hierarchically organized. It is subordinate to four principles (P). To every principle, it has one or more of several guidelines (G). Their total number is 12-13 (according to the WCAG 2.1 website). A total of 78 success criteria (SC) are available for each guideline. SCs are the basis of the standard, as with them, the accessibility of the content is tested. Principles and guidelines serve for their logical organization.

The four principles of the standard are the following:

P1. Perceivable - the user interface and the information on the site should be so presented to users so that they can be easily understood. This means that consumers must be capable of perceiving the information provided (it should not be hidden for all their senses);

P2. Operability - It is necessary to achieve easy manageability of the user interface and the provided navigation. Users must be able to use the

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

interface (the interface can not require an interaction in which the user can not participate);

P3. Understandability - The information found on the site and the work of the user interface must be able to be easily understood. Consumers need to be able to understand information and the work of the user interface (content or management should not be beyond their understanding);

P4. Robust- Content must be robust to be reliably interpreted by a wide range of consumer agents and assistive technologies. Users must be able to access the content in sync with advances in technology (with the development of technology and consumer agents, content must remain accessible).

Each success criterion is assigned to any of the three levels - A, AA and AAA. The lowest level is marked with A, and the highest level with AAA. Success criteria of level A typically refer to the widest range of users and more than one disability. The criterion of level A gives the least visual impact on site performance, and its execution would be the least complicated. Criteria of level AA are also of major importance for PD, although sometimes they have a narrower scope and compliance may have an impact on the overall vision of the site. Criteria of level AAA are typically targeted at specific user groups and are more complex and resource-intensive to implement (Bogdanova, Sabev & Tomov, 2014).

The next element of the standard are techniques for implementing the success criterion and sample code. Techniques are updated twice a year and are not necessarily mandatory.▫

There are:

1. enough techniques - a safe way to meet the criteria for success.
2. consultative techniques - recommended ways to improve accessibility.
They are not considered as enough techniques.

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

3. failures - circumstances that place barriers to accessibility. □

We will present below a sample code intended to show only the specific item discussed at the point of purchase. It may not be the best practice for other aspects of accessibility, unrelated to that technique.

Specific example of placement label for MathML. The example shows the MathML function with the role math, appropriate label and MathML presentation:

```
<div role="math" aria-label="6 divided by 4 equals 1.5">  
<math xmlns="http://www.w3.org/1998/Math/MathML">  
<mfraction>  
<math>6</math>  
<math>4</math>  
</math>  
<math>=</math>  
<math>1.5</math>  
</math>  
</div>
```

Methodology

Goal and scope of the survey

In many countries a number of studies have been conducted about the accessibility of sites by the public sector. The experience from previous similar studies (Kurt, 2011; Lazar, Allen, Kleinman, & Malarkey, 2007; Mankoff, Fait, & Tran, 2005; Ringlaben, Bray, Packard, 2014; Wentz, Bittle,

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

Hidey & Vickers, 2013) has been studied, adapted and applied to selected sites in the Bulgarian public sector.

The purpose of the study is to examine the accessibility of public administration sites in the Republic of Bulgaria.

Based on the success criterion of Web Content Accessibility Standard in the Republic of Bulgaria, a survey was carried out on 100 websites of public institutions. This is the most comprehensive accessibility study for disabled people conducted on the territory of the country. Its planning and implementation were carried out by the Horizons Foundation, with the participation of the authors of the project "Civil Initiative for Web Accessibility in the Public Sector", financed under the Program for Support of Non-Governmental Organizations in Bulgaria under the Financial Mechanism of the European Economic Area 2009-2014. The study was conducted within 9 months in 2015-2016.

In September and October 2019, the survey was repeated by one of the authors of the paper (with 100% visual impairment), expert, who participated in the first survey, IT specialist. The results of the two surveys were compared.

Selecting on sites for testing

The selection of 100 sites to be tested for the purpose of the study was made by the Foundation of the Blind in the Republic of Bulgaria, the selection criteria being the following: to test those public administration sites that are most needed, most useful, most visited by people with visual impairments in the Republic of Bulgaria.

The website's accessibility evaluation can be performed in two ways: manually by experts or by applying automatic tools (Rahmatizadeh, Saeideh Valizadeh-Haghi, 2018). Both methods were applied in the study: the method of direct testing by people with visual impairments and the automatic

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

method. Testing by participants volunteers with severe visual impairments who are not familiar with computing technology can only be manual, so the tests provided give a real idea of the ability of people with visual impairments to use the sites. About 50% of the websites are also tested by visually impaired IT professionals (project experts and Horizons Foundation representatives). A site testing and evaluation method were selected using a questionnaire with a maximum score of 111 points. Experimental testing of 70 public Internet sites was conducted with an online questionnaire of 25 volunteers and five mentors. Key project experts tested the other 30 websites.

Analysis of the information structure of the sites was developed, it was examined whether the sites contain: site map, content map, structural grid; content types, navigation types, general vision of the site and more.□

Second Testing

The re-evaluate the accessibility of the websites was conducted in September and October 2019. A combination of manual and automated testing was used. Testing was performed using the same questionnaire as the first testing. The new testing takes into account the changes included in the WCAG 2.1 standard. The new evaluation should be based on the WCAG 2.1 standard, which is what is required in the European Union.

For some of the criteria when testing websites, the following two tools are very appropriate and are used in the testing process: Wave (Wave - web accessibility evaluation tool) and aXe (Developer Tools for Web Accessibility Testing).

Purpose of the study

The purpose of the research was to determine the degree of accessibility of public websites in Bulgaria for disabled people and to prove the working

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

hypothesis that public sites in Bulgaria are not sufficiently accessible to people with disabilities. To achieve the stated goal, the tasks of studying the methods and sites, the testing of the selected sites was provided, the analysis of the results and the conclusions of the study were formulated. According to W3C (Website Accessibility Conformance Evaluation Methodology, 2014) in assessing each accessibility site for disabled people, it is recommended to determine the scope of the assessment; researching the targeted website; selecting a representative sample; an audit of the selected sample; findings.

Stages of the study

The study was conducted in several stages:

1. Theoretical - The documentation of Web Content Accessibility Guidelines has been studied, translated in Bulgarian, systematized and optimized. At this stage, the Web Accessibility Handbook (Bogdanova, Sabev, & Tomov, 2016, in Bulgarian) has also been developed. Current methods have been explored for evaluation accessibility of sites for people with disabilities.
2. Preparatory - materials were provided in an optimized volume of testing groups (participants and volunteers). Testing and assessment of web accessibility for people with disabilities were also conducted.
3. Practical - It was created an online questionnaire form from the Guide to be completed by each examiner.
4. Final - At this stage, the results obtained were summarized and analyzed, with the relevant conclusions and recommendations presented at a press conference and at the same time provided to the relevant institutions.

Scope of the study

The conducted research was focused only on sites of public institutions on the territory of the Republic of Bulgaria, grouped in five groups, as follows:▫

- Group 1: Central State Authorities (President, Council of Ministers, National Assembly, Bulgarian National Television, Bulgarian National Radio, Ombudsman) - 6 web site.
- Group 2: Ministry of the Republic of Bulgaria - 18 web sites;
- Group 3: District administrations in the Republic of Bulgaria - 22 web sites;
- Group 4: Municipalities in the Republic of Bulgaria - 26 websites;
- Group 5: Agencies, committees, and others - 28 websites.

A full description of all sites tested with names of tested public sites and links to them is given in the List URL of the analyzed of 100 public web sites in Bulgaria for Accessibility Testing (List of 100 public sites, 2019).

Accessibility of content - the presentation of information and user interface components - has been studied.

The testers were people with disabilities with varying degrees of impaired vision, which gives a more realistic assessment of the practical accessibility for this group of people. Testing was limited to AA success criterion from Web Content Accessibility standard, as out of the total criterion success, those that do not directly affect the target group of visually impaired people have been excluded.

Model of testing

The study of public web sites in the practical and final stages was organized according to the following model:

- Selection and formulation of research questions (to be linked to the AA criterion success);

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- Creating an interactive online question and answer form;
- Survey, scope, and choice of site evaluation system;
- Exploring and conducting of tests for each site (for compatibility with AA level);
- Evaluation of the sample sampling for each site (for compatibility with AA level under standard);
- Generating site survey results in tabular form and graphical appearance (diagrams);
- Analysis of results and conclusions;
- Correction of obtained results, taking into account the human subjective factor.

The developed online questionnaire is a web accessible to disabled people. It contains thirty questions (Table 1) that are directly related to the Web Content Accessibility Guidelines Standard successful criterion. The questions cover the first three principles of the WCAG standard. Each site has been researched and representative samples of test pages have been selected, all pages of the site tested if possible. Major research has been done through the so-called “consumer” testing of sites with visually impaired people (IT specialists and volunteers). Approximately 50% of websites have been tested by visually impaired IT professionals (project experts and representatives of the Horizons Foundation).

Table 1. Questions in the conducted survey and number of response options

Number	Question	Provided for response
1	When you open the page is there automatic loading of a sound with a duration longer than 3 seconds? ^[2]	2

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

Number	Question	Provided for response
2	If the duration of the sound that is automatically loaded on the page is more than 3 seconds, can he be easily stopped or his power to decrease without affecting the speech synthesizer volume?	3
3	If the site contains a navigation menu or advertising information, which is located on many rows, is there an opportunity for skipping this section? ²	3
4	If the site contains multiple rows, were they realized as the headings of the parts as separate titles (headings)? ²	4
5	If the site contains a hierarchically organized complex system of titles, were they made like titles of different levels?	4
6	Is there a map of the site in an accessible HTML format?	2
7	Do the frames and regions names indicate what is contained in them?	4
8	The elements of which the sites are built, were they structured well? Were they stacked in blocks?	2
9	Is there an explanatory text for graphic images?	4

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

Number	Question	Provided for response
10	Are active elements used without text information?	3
11	For web forms in which information needs to be filled in - were understandably and clearly titled their fields and elements?	4
12	If verification is provided of the correctness of the data entered in the webform, were the diagnostic messages appear in a place in which will be easily noticed by a screen reader?	4
13	Are there any active elements, the type of which is not reported by systems for speech accompaniment?	3
14	Does the site contain links or buttons whose text does not suggest the action that will be performed upon activation?	3
15	Are there fonts to increase the font size and provide a contrasting view?	3
16	Are the colours mixed together? Is there a good contrast in the colour ratio?	3
17	Is there a possibility to exclude the predicate's actions? (Word or phrase writing)	3

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

Number	Question	Provided for response
18	<p>If there is animation or video on the site, are there any text or speech, which explain to them?</p> <p>If the site provides information via speech reproduction (voice recording), has here a text that renders the same information?</p>	4
19	<p>If the site has text depicted as a graphic to confirm that the person who is opening is a human, not a robot, is there alternative access to the text?</p>	2
20	<p>Are the values, rendered as graphics and diagrams, depicted in digital form - text or tables?</p>	4
21	<p>When the mouse pointer crosses a plot with a certain action, is there an alternative activation of said action?</p>	4
22	<p>If provided refresh site content through definitely time, is this leads to difficulty in screen reading reader?</p>	3
23	<p>If the page contains text in different languages, is it used to designate the language of the web page and the individual fragments of her?</p>	4
24	<p>Does the page contain active elements with which the screen reader can not interact?</p>	4
25	<p>Does the page contain active elements with which the screen reader can not interact?</p>	3

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

Number	Question	Provided for response
26	Can all actions provide on the site be performed using a keyboard? ²	3
27	If the site sets time limits for certain actions, can these limits be easily extended or discontinued?	3
28	Is it necessary to respond to a specific action at a specific moment?	2
29	Are the documents, downloaded from the site, made in an accessible format for work with a screen reader? ²	4
30	Specific remarks and recommendations.	

Information about participants - volunteers who have tested web sites

Experimental research and testing on the proposed model of 70 of the surveyed public Internet sites were carried out by 25 volunteers and five mentors. The remaining 30 websites have been tested by key project experts.

Demographic profile of respondents

This section analyses the various demographic characteristics of the respondents (25 volunteers).

Main criteria for selecting volunteer participants:

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

1. Volunteers must be blind and thus meet the target group of Horizonti Foundation conducting the survey;
2. they must have a good command of computer applications and the Internet;
3. Volunteers should be well acquainted and use a screen reader in their day-to-day work.

Age distribution

The age distribution of the respondents who participated in the study is provided in Table 2. The volunteer participants have a lower age of 22 and the upper 64 at the time of the project tests.

Table 2. Age distribution of the respondents

Age group	The number of people	The percentage represented in the population □
21-29	5	20%
30-39	4	16%
40-49	12	48%
50-59	3	12%
60-69	1	4%

Gender composition

The gender composition of the respondents was 19 males and 6 females. □

Educational background of respondents

Participants with higher education: 17

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

Participants with secondary schooling: 8

Among the volunteers, there are participants with higher education and participants with secondary education, which makes it possible to assess the web accessibility of the sites by participants with different degrees of education. At the same time, the different education factor is not considered as determining for the study.▫

Employment

At the time of the project tests in the group, there are six unemployed (for three of the participants missing information).

Degree of visual impairment

1. Six people with low vision;
2. Eighteen fully blind;
3. One colourblind.

The volunteer participants are from different localities of the Republic of Bulgaria: Varna, Dobrich, Burgas, Silistra, Gabrovo, Plovdiv, Perushtitsa and Sofia. This selection of visually impaired volunteer participants gives an idea of how participants from different territorial areas can handle the challenges of the global network.

Results

Results of research and testing on public sites

The majority of the test participants (96 .5%) used a screen reader with a speech synthesizer in the test process; while 3.5% of the participants - a software screen magnifier. The two most popular screen readers used in Bulgaria - NVDA (the current version in the moment of the test) and JAWS (versions 14 to 17) and, to a lesser extent, screen magnifiers were used in

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

the tests. The browsers used in testing are also varied - Internet Explorer is represented by two versions - 11.10, Mozilla Firefox (versions 44, 43, 33) and Google chrome by not specifying the versions used. The different types and versions of operating systems, browsers and screen readers, with which the test is performed, influence the results and contribute to their more difficult comparability. Based on the developed assessment methodology, the evaluation score obtained ranks the sites in groups according to their degree of accessibility, and for each group, the following points are specified:▫

- Inaccessible site - under 30 points;
- Low accessible website - from 30 points to 50 points;
- Partially accessible site - from 50 points to 80 points;
- Affordable site (to a large extent) - with over 80 points.

It is important to emphasize that such accessibility assessment for Web Content Accessibility Guidelines not defined. A site is classified as either accessible or inaccessible. This grouping by category was chosen by the authors to provide a more comprehensible presentation of the results to a broader audience.

Necessity from the applied model correction

When conducting user testing by volunteer participants, there is a possibility that some of the results obtained, which take into account the accessibility of information on public sites, may prove to be inadequate due to the influence of the subjective human factor. This subjective factor always has its influence because human beings are not unified units. The reason for the influence of the subjective factor may be, for example, the different levels of knowledge of accessibility technologies used, different computer literacy and lack of experience in using technology. A significant drawback of such testing methods is the application of the principle of testing one site by one person only. If the user who performs the test is not very experienced, he will not be able to cope optimally with the specific

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

situation, and this will influence the final evaluation. It is a good idea to reduce the weight of the assessment when conducting testing by volunteer participants with insufficient computer skills and knowledge, as these assessments are either not taken into account or rechecked. Another obvious disadvantage of the assessment methodology is the weight greater than a unit of some of the questions. This approach may also lead to distortion of the results. In the binary evaluation with "yes" and "no" (0 and 1), this subjectivity can be avoided. From this point of view, the proposed and experimental testing methodology needs improvement.

The point at which some of the questions are inapplicable to a site should also be refined. An example of such a question is the availability of available video content in the research site. In the present study, the lack of video content is considered as a positive fact and increases accessibility assessment for that site. When this is combined with the added weight of the issue, there is a possibility that the distortion of the results will increase. The reason is that, in the absence of some inaccessible elements, points are given which, in certain cases, attach more weight to their lack than to the availability of accessible ones. This makes it possible for the phenomenon of inaccessible or more difficult to use websites in overall results to be equally accessible or more accessible than sites with a higher level of accessibility.

The participants - experts conducting and evaluating the survey - performed an initial review and analysis of the results of the given questions. To make the results more accurate, additional testing and corrections were required. For example, one of the sites tested, which was known to past visit experts as practically inaccessible, in the test proved to be relatively affordable. New tests and fixes for the site's results were made. New tests were also made for other inconsistencies noted.

The drawback of the deficiencies so identified is that the proposed testing methodology can continue to be developed and that new improvements and

corrections are introduced to counteract the negative effects on the outcome of the tests.

Conclusions and findings

Following the corrections and control iterations of some of the tests, the conclusion and analysis of the results resulted in the following conclusions:▫

1. In Access Category 4 (a widely accessible site) 50% of sites are included.
2. Access to the remaining 50% of the sites tested is problematic.

The conclusions concluded confirm the initial working hypothesis that a large part of the researched sites in the public sector in the Republic of Bulgaria is inaccessible for people with disabilities (for level AA).

A particularly striking example of inaccessibility under the Success Criterion 1.1.1 is the so-called CAPTCHA - Completely Automated Public Turing test to tell Computers and Humans Apart (CAPTCHA: Telling Humans and Computers Apart Automatically). Based on the survey results, 60% of sites use CAPTCHA (Question 19, Success Criterion1.1.1). This has led to the visually impaired visitor being prevented from entering the web site, as for most people with visual impairment, a suitable alternative is not provided. 10% of these sites provide an affordable alternative, and 20% of sites do not exist. In most cases, the difficulty extends beyond eliminating whether a visitor is a robot or a person. So the web developer manages to eliminate access for well-meaning internet users as well.

Below is a list of some of the other findings made about the accessibility of public sites:

1. Missing or incorrect use of HTML headings (titles);
2. Absence of meaningful alternative text to the images;

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

3. No links to skip to the main content;
4. Insufficient colour contrast, among others.

From the results and the findings that only half of the sites surveyed can be identified as being relatively accessible to disabled people, the main conclusion is that public sector sites in Bulgaria have not yet gone their way to the global and European requirements - AA level.

Summary of test results

Accessibility category 4 (a widely accessible web site) accounts for 50% of the web sites. Access to the remaining 50% of the web sites tested is problematic.

The results prove that the underlying hypothesis corresponds to reality because 50% of the sites surveyed proved to be difficult to reach for blind users.

Some examples:

1. Slightly accessible

In this category are the websites of Commission for Protection of Competition, Bulgarian National Television, Ministry of Labor and Social Policy, Ministry of Agriculture and Food, Patent Office, Agency for People with Disabilities; the websites of municipalities Sliven, Rousse, Vidin; web sites of regional administrations Vratsa, Varna, Bourgas and others.

2. Highly accessible

This category includes the websites of Commission for Protection against Discrimination, Agency for Social Assistance, Ministry of Internal Affairs, National Statistical Institute, Bulgarian Posts, the sites of regional administrations of Blagoevgrad, Dobrich, Razgrad,

Sliven, municipalities Samokov, Varna, Razgrad. Velingrad, Koprivshtitsa, and others.

Using the results obtained from the research in the future work of the authors

Good solid experience has been gained in the study of the accessibility of public websites in the Republic of Bulgaria, a successful methodology for testing web accessibility has been created and improved, experience has been gained in working with people with special needs. The results obtained regarding the accessibility of the public websites in the Republic of Bulgaria and the main problems encountered by people with disabilities (and, more specifically, people with visual deficits) will be used in the future work of the authors' team on accessibility issues. An information website is to be developed by the members of the team, which aims to inform the public about the work and the results of the project team in the field of research of mathematical technologies for processing and analysis of physiological data. The made conclusions and findings from the study described in this paper will be applied to improve the accessibility of people with visual deficits to digitized databases, information websites and software systems for the analysis of physiological data.□

Comparison of the two studies

The comparison shows that overall website accessibility has improved (by an average of 17.2%). 6 of the websites surveyed showed a decrease in accessibility. For a large number of sites, there is no change in the results obtained from the new testing performed (compared to the results of the first study). There is a positive change towards increasing the accessibility of websites, but it is small and has not happened in all the websites studied.

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

Improvements in accessibility were seen on websites that had very little accessibility (less than 32%) when they first tested.

Legal provisions on web accessibility in Bulgaria

The European Parliament and the European Council adopted Directive (EU) 2016/2102 on the accessibility of the websites and mobile applications of Member States' public sector organizations. This document is gaining popularity as the "Web Accessibility Directive". At its core, the Directive seeks to serve both EU citizens and web service providers by facilitating the completion of an internal market for website accessibility, by approximating the laws, regulations and administrative provisions of the Member States on the accessibility of websites.

Accessibility is an integral part of the principle of equal rights for citizens. Article 41, paragraphs 1 and 2 of the Constitution of the Republic of Bulgaria establishes the right of access to information and freedom of expression and opinion as a fundamental principle. Everyone's right to "seek, receive and impart information" is guaranteed as well, and all citizens have the right "to receive information from a public authority or agency on matters of legitimate interest to them if the information is not state or other secretly protected by law, or does not affect someone else's rights" (Constitution of the Republic of Bulgaria, 2015).

New disability law (in force since 01/01/2019) repealed the old disability integration law (Law on people with disabilities, 2018), it essentially regulating public relations in the exercise of the rights of citizens belonging to this social group. The purpose of the law is to create conditions and guarantees for equality, social integration and support for people with disabilities. Article 5 (paragraph 2, point 7) defines accessible information as one of the means of social inclusion of people with disabilities. The directive was supposed to be transposed into domestic law by 23/09/2018, but as this is not yet a fact, this has many negative consequences for Bulgaria. The old

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

provisions of the Law on Electronic Governance and the Ordinance on Electronic Administrative Services apply.

At the moment (October 2019), a law has not yet been adopted in Bulgaria to ensure compliance with the Accessibility Directive of the European Union. Improving accessibility for public administration sites in Bulgaria is currently a matter of voluntary action. The authors of the paper hope this study will help to discuss the problem of accessibility of websites in the Republic of Bulgaria and to solve it soon.

Statistical analysis

To examine the differences in accessibility issues rate among five groups of websites, ANOVA test on the f -ratio value and p -value was performed. The results were considered significant at $p < 0.05$. Statistical analysis carried out using the IBM SPSS Statistics software, Version 23 (IBM Corp., USA).

The obtained results for the accessibility of the individual site groups in the second survey are shown in table 3.

Table 3. Exploring accessibility in different site groups

	Group 1	Group 2	Group 3	Group 4	Group 5
Accessibility assessment [%]	78±15.21	93.00 ±7.43	80.5±16.75	82.88±15.24	84.86±13.84
p-value	p-value (1,2 group) 0.003088	-	p-value (3,2 group) 0.00565	p-value (4,2 group) 0.012719	p-value (5,2 group) 0.027015

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. Journal of Accessibility and Design for All. doi: 10.17411/jacces.v10i1.215

	Group 1	Group 2	Group 3	Group 4	Group 5
f-ratio value	f(1,2 group)	-	f(3,2 group)	f(4,2 group)	f(5,2 group)
	11.04287		8.60696	6.77515	5.23384

Statistically significant differences were found when comparing the second group (with the best accessibility scores) with each of the other groups. Statistically significant difference among the 1 and 2 groups is $p < 0.001$. Statistically significant differences were also found between all groups (f-ratio value is 2.47607. The p-value is 0.049356).

Conclusion

The article presents the results of two surveys conducted on the web accessibility of public sites in Bulgaria by people with disabilities (in particular people with visual deficits). The article describes the web accessibility standards on which the study is based, the survey participants, the methodology and the way the survey is conducted, and the online questionnaire created for the survey. Questions cover opportunities, ways of coping, and the time required to access web resources. The results obtained are based on the responses of people with disabilities - experts and volunteer participants.

The second survey shows an increase in the accessibility of some of the surveyed public websites in Bulgaria. However, this increase is small and not sufficient to achieve adequate accessibility for the convenient use of the sites by people with visual impairments. The conducted statistical analysis shows that the availability of the websites of the ministries in the Republic of Bulgaria is the best, which indicates the willingness of the maintainers of these sites to provide accessibility for disabled people.

The main conclusion is that a small part of the surveyed public sites in Bulgaria is accessible to people with disabilities. Much of the sites make it difficult for people with disabilities, and only a small part of the sites are fully accessible. It is concluded that web developers in the Republic of Bulgaria should aim to improve the web accessibility of information on public sites for people with disabilities. The conclusions will be used in the future work of the authors of the article - creating a web site for the current project of the team and a software system for analysis of physiological information. The aim is to achieve a successful inclusion in the research work on the processing and analysis of physiological data by a member of an authoring team having this problem. For the results achieved in this direction, the authors will report in their next publications.

The conclusions made of this study and the experience gained will be used by the team in their current work on a research project in the field of the research of mathematical technologies for the analysis of physiological data and the inclusion in this activity of people with visual deficits.

Acknowledgments

This work was supported in part by Grant 1909C/2020 of the Technical University of Gabrovo, Bulgaria.

References

- [1] Anctil, E. (2008). Selling higher education: Marketing and advertising America's colleges and universities. *Jossey-Bass Inc Pub*.
- [2] Bogdanova, G., Sabev N., & Tomov G. (2016) Web Accessibility Handbook, *Horizons Foundation, Sofia*, in Bulgarian, <http://webaccess.horizonti.bg/narychnik>
- [3] CAPTCHA Telling Humans and Computers Apart Automatically, *Official CAPTCHA site*: <http://www.captcha.net>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- [4] ISO/IEC 40500:2012, <https://www.iso.org/standard/58625.html>
- [5] Kane, S.K., Shulman, J.A., Shockley, T.J. & Ladner, R.E. (2007). A web accessibility report card for top international university web sites. *Proceeding of the 2007 international cross-disciplinary conference on Web accessibility (W4A)*, 148-156.
- [6] Kurt, S. (2011). The accessibility of university web sites: The case of Turkish universities", *Universal Access in the Information Society*, Vol.10, No 1, 101-110.
- [7] Lazar, J., Allen, A., Kleinman, J., & Malarkey, C. (2007) What Frustrates Screen Reader Users on the Web: A study of 100 Blind Users. *International Journal of Human-Computer Interaction*, 22(3), 247-269.
- [8] Lee, S., & Koubek R.J., (2010). The effect of usability and web design attributes on user preference for e-commerce web sites. *Computer in Industry*, 61(4), 329-341.
- [9] Mankoff, J., Fait, H., & Tran, T. (2005) Is your web page accessible?: A comparative study of methods for assessing web page accessibility for the blind. *Proceedings of the ACM Conference on Human Factors in Computing Systems*, 41- 50.
- [10] Rahmatizadeh, S., & Valizadeh-Haghi, S. (2018). Monitoring for accessibility in medical university websites: meeting the needs of people with disabilities. *Journal of Accessibility and Design for All*, 8(2), 102-124, <http://dx.doi.org/10.17411/jacces.v8i2.150>.
- [11] Ringlaben, R., Bray, M. & Packard, A. (2014). Accessibility of American University Special Education Departments' Web sites. *Universal Access in the Information Society*, 13(2), 249-254.
- [12] Stitz, T., Blundell S. (2018) Evaluating the Accessibility of Online Library Guides at an Academic Library. *Journal of Accessibility and Design for All*, 8(1), 33-79, doi:<http://dx.doi.org/10.17411/jacces.v8i1.145> .
- [13] Thompson, T., Comden, D., Ferguson, S., Burgstahler, M., Moore, E. Seeking Predictors of Web Accessibility in U.S. Higher Education Institutions, *Inf. Technol. Disabil.* Vol. 13, Num 1, 2013, <http://itd.athenpro.org/volume13/number1/thompson.html>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- [14] W3C. (2008) Web Content Accessibility Guidelines (WCAG) 2.0, Retrieved November 22, 2018, from <http://www.w3.org/TR/WCAG20/>
- [15] Web Content Accessibility Guidelines (WCAG) 2.1 W3C Recommendation the 05th of June 2018, Retrieved October 22, 2018, from <https://www.w3.org/TR/WCAG21/>
- [16] Website Accessibility Conformance Evaluation Methodology (WCAG-EM) 1.0, W3C Working Group Note 10 July 2014, Retrieved November 4, 2018, from <https://www.w3.org/TR/WCAG-EM/>
- [17] Wentz, B., Bittle K., Hidey D. & Vickers, P. (2013). Investigating the Web Site Accessibility of Major, Investor-owned Utility Providers in Maryland, Pennsylvania, and West Virginia. *Proceedings of the Nineteenth American Conference on Information Systems, Chicago, Illinois*, 14-17.
- [18] World report on disability, World Health Organization, Retrieved December 5, 2018, from http://www.who.int/disabilities/world_report/2011/report/en/
- [19] Understanding WCAG Level, Retrieved November 22, 2018, from <http://www.karlgroves.com/2013/05/20/understanding-wcag-level/>
- [20] Karhu, M., Hilera, J. R., Fernández, L., Ríos, R. (2012). Accessibility and readability of university websites in Finland, *Jornal of Accessibility and Desing for All*, Vol. 2, No 2, pp. 178-190, <https://doi.org/info:doi/10.17411/jacces.v2i2.70>
- [21] Kurt, S. (2011). The accessibility of university websites: The case of Turkish universities. *Universal Access in the information Society*, 10(1), 101-110, <https://doi.org/10.1007/s10209-010-0190-z>
- [22] Kurt, S. (2017). Accessibility of Turkish University Web sites. *Universal Access in the Information Society*, Vol. 16 (2), pp. 505-515, <https://doi.org/10.1007/s10209-016-0468-x>
- [23] Kurt, S. (2019) Moving toward a universally accessible web: Web accessibility and education. *Assistive Technology*, Vol. 31(4), pp.199-208, DOI: 10.1080/10400435.2017.1414086
- [24] Acosta, T., Lujan-Mora, S. (2017). Analysis of the accessibility in websites of Ecuadorian universities of excellence. *Enfoque Ute*, Vol. 8(1). pp.46-61.

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- [25] List of 100 public sites in Bulgaria for Accessibility Testing, <https://bit.ly/2BwDvMr>
- [26] Bradbard D., Peters C. (2010) Web Accessibility Theory and Practice: An Introduction for University Faculty, *The Journal of Educators Online*, Vol. 7, Num. 1, pp. 1-46.
- [27] Cocquebert, E., Trentesaux, D., & Tahon, C. (2010). WISDOM: A website design method based on reusing design and software solutions. *Information and Software Technology*, Vol. 52(12), pp. 1272-1285.
- [28] Hassouna, M., Sahari, N., & Ismail A., University Website Accessibility for Totally Blind Users, *Journal of ICT*, 16, No. 1 2017, pp. 63-80.
- [29] Harrison, S., Barlow, J., & Williams, G. (2007). The content and interactivity of health support group websites. *Health Education Journal*, Vol. 66(4), pp. 371-381.
- [30] Wegge, K.P., & Zimmerman, D. (2007). Accessibility, usability, safety, ergonomics: concepts, models, and differences. In C. Stephanidis (Ed.), *Universal access in human computer interaction*. Coping with diversity (pp.294-301). Heidelberg: Springer Berlin.
- [31] Maisak R., Accessibility of Thai university websites: Awareness, barriers, and drivers for accessible practice, Theses, *Edith Cowan University*, 2015. Retrieved from <https://ro.ecu.edu.au/theses/1715>
- [32] Nir H., Evaluation of Web content accessibility in an Israeli institution of higher education, *Universal Access in the Information Society*, 2018, Vol. 17, No 3, pp. 663-673.
- [33] Solovieva T., Bock J., Monitoring for Accessibility and University Websites: Meeting the Needs of People with Disabilities, *Journal of Postsecondary Education and Disability*, 27(2), pp. 113 - 127, 2014.
- [34] Wave (Wave - accessibility evaluation tool), <https://wave.webaim.org>
- [35] aXe Developer Tools, <https://chrome.google.com/webstore/detail/axe-web-accessibility-tes/lhdoppojpmngadmndnejfpokejbdd>
- [36] Constitution of the Republic of Bulgaria (in Bulgarian), 2015, <https://www.parliament.bg/bg/const>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- [37] Law for people with disabilities, (in Bulgarian), 2018,
<http://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=132871>.

Appendix

List of 100 public sites for Accessibility Testing

- 1 Council of Ministers of the Republic of Bulgaria,
<http://www.government.bg>
- 2 Ministry of Economy of the Republic of Bulgaria,
<http://www.mi.government.bg>
- 3 Ministry of Foreign Affairs, <https://www.mfa.bg/>
- 4 Ministry of Interior, <https://www.mvr.bg>
- 5 Ministry of Health, <https://www.mh.government.bg>
- 6 Sofia Municipality, <https://www.sofia.bg>
- 7 Commission on Protection against Discrimination, <http://www.kzd-nondiscrimination.com/layout/>
- 8 Employment Agency, <http://www.az.government.bg>
- 9 Municipality of Koprivshitsa, <http://koprivshitsa-bg.com>
- 10 Municipality of Samokov, <http://samokov.bg>
- 11 Ministry of Agriculture, Food and Forestry,
<https://www.mzh.government.bg/en/ministry/>
- 12 Municipality of Rousse, <http://ruse-bg.eu>
- 13 Character Agency, <http://ahu.mlsp.government.bg>
- 14 Communication of culture, <http://www.mc.government.bg>
- 15 Ministry of Education and Science, <http://www.minedu.government.bg>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- 16 Ministry of Environment and Water, <http://www.moew.government.bg>
- 17 Municipality of Kardjali, <http://www.kardjali.bg/>
- 18 Municipality of Razgrad, <http://www.razgrad.bg/>
- 19 Kardzhali Regional Administration,
<http://www.kj.government.bg/index.php?lang=bg>
- 20 Blagoevgrad District Administration,
<http://www.bl.government.bg/>
- 21 Ministry of Energy, <https://www.me.government.bg/bg>
- 22 Ministry of Defense, <http://www.md.government.bg>
- 23 Silistra municipality, <http://www.silistra.bg>
- 24 Consumer Commission (CPC), <https://kzp.bg/>
- 25 Bulgarian National Television, <http://www.bnt.bg>
- 26 Burgas municipality, <http://www.burgas.bg/>
- 27 Bulgarian National Bank, <http://www.bnb.bg/>
- 28 Pazardzhik Municipality, <http://www.pazardjik.bg>
- 29 Veliko Turnovo District Administration, <https://vt.government.bg/>
- 30 State Agency for Bulldozers Abroad, <https://www.aba.government.bg/>
- 31 Bulgarian Post, <http://www.bgpost.bg/>
- 32 Municipality of Kyustendil, <http://www.kustendil.bg/>
- 33 National Accreditation Assessment Agency,
<http://www.neaa.government.bg/>
- 34 People's meeting, <http://www.parliament.bg/>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- 35 Operational Program "Competitiveness",
<http://www.opcompetitiveness.bg/>
- 36 Ministry of Tourism, <http://www.tourism.government.bg>
- 37 Public Procurement Agency, <http://www.aop.bg>
- 38 Municipality of Vratsa, <http://www.vratza.bg/>
- 39 State Gambling Commission, <http://www.dkh.minfin.bg/>
- 40 Customs Agency, <https://customs.bg/>
- 41 District administration of Lovech, <http://oblastlovech.org>
- 42 State Commission on Information Reliability, <http://www.dksi.bg/>
- 43 National Legal Aid Bureau, <http://www.nbpp.government.bg/>
- 44 Municipality of Varna, <http://www.varna.bg>
- 45 Municipality of Vidin, <http://vidin.bg/>
- 46 Ombudsman of the Republic of Bulgaria, <http://www.ombudsman.bg/>
- 47 Municipality of Lovech, <http://www.lovech.bg>
- 48 Ministry of Justice, <http://www.justice.government.bg/>
- 49 Municipality of Smolyan, <http://www.smolyan.bg/bg/home>
- 50 Vratsa Regional Administration, <http://vratza.bg>
- 51 National Insurance Institute, <http://www.noi.bg/>
- 52 National Library "St. St. Cyril and Methodius",
<http://www.nationallibrary.bg/>
- 53 Bulgarian national radio, <http://bnr.bg/>
- 54 District administration Razgrad, <http://www.rz.government.bg/bg>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- 55 State Agency for Metrological and Technical Supervision,
<http://www.damtn.government.bg/>
- 56 District administration of Sliven, <http://www.sliven.government.bg/>
- 57 Ruse Regional Administration, <http://ruse.bg/>
- 58 Regional administration of Smolyan, <http://region-smolyan.org/>
- 59 Municipality of Slivenhttp, <http://www.sliven.bg/>
- 60 Silistra District Administration, <http://www.ss.government.bg/>
- 61 Commission for Protection of Competition, <http://www.cpc.bg>
- 62 Municipality of Velingrad, <http://www.m.velingrad.bg/>
- 63 Gabrovo Municipality, <https://gabrovo.bg/bg>
- 64 District Administration Plovdiv, <http://www.pd.government.bg/>
- 65 Executive agency electronic connection to networks and information systems, <https://www.esmis.government.bg/>
- 66 Municipality of Razgrad, <http://www.razgrad.bg/>
- 67 Municipality of Pomorie, <http://pomorie.bg/>
- 68 Patent Office, <http://www.bpo.bg/>
- 69 Pazardzhik Regional Administration,
<http://www.pz.government.bg/news.php>
- 70 Kyustendil Regional Administration, <http://www.kn.government.bg/>
- 71 National Agency for Vocational Education and Training,
<http://www.navet.government.bg/>
- 72 Plovdiv Municipality, <http://www.plovdiv.bg/>
- 73 District administration of Pleven, <http://www.pleven-oblast.bg/>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- 74 Municipality of Pleven, <http://www.pleven-oblast.bg/>
- 75 Website of the Central Election Commission, <https://www.cik.bg/>
- 76 District Administration Sofia, <http://sofoblast.bg/>
- 77 President of the Republic of Bulgaria, <http://www.president.bg>
- 78 District administration of Pernik, <http://www.pernik.e-gov.bg/Harta.htm>
- 79 Gorna Oryahovitsa Municipality, <http://www.g-oryahovica.org>
- 80 Operational Program "Human Resources Development",
<http://ophrd.government.bg/>
- 81 District administration of Gabrovo, <http://www.gb.government.bg/>
- 82 Montana County Administration, <http://oblastmontana.org/>
- 83 The municipality of Montana, <http://www.montana.bg/>
- 84 Pernik Municipality, <http://pernik.bg/>
- 85 State Agency for Child Closure, <http://sacp.government.bg/bg/>
- 86 Ministry of Regional Development and Public Works,
<http://www.mrrb.government.bg/>
- 87 Transport, Information Technology and Communication Communication in the Republic of Bulgaria MTITC, <https://www.mtitc.government.bg/>
- 88 Ministry of Labor and Social Policy of the Republic of Bulgaria,
<http://www.mlsp.government.bg>
- 89 Ministry of Finance, <http://www.minfin.bg/>
- 90 District administration of Dobrich, <http://www.dobrich.government.bg>
- 91 Court of Auditors, <https://www.bulnao.government.bg/>
- 92 Youth and Sports Communication, <http://mpes.government.bg/>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

- 93 Social Assistance Agency SAA, <http://asp.government.bg>
- 94 National Statistical Institute NSI, <http://www.nsi.bg>
- 95 Registry Agency, <http://www.registryagency.bg/>
- 96 Commercial register, <http://www.brra.bg>
- 97 National Revenue Agency NRA, <http://www.nra.bg>
- 98 Regional administration of Burgas, <http://www.bsregion.org/>
- 99 Blagoevgrad Municipality, <http://www.blgmun.com/>
- 100 Varna Regional Administration, <http://www.vn.government.bg/>

Sabev, N., Georgieva-Tsaneva, G., & Bogdanova, G. (2020). Research, analysis, and evaluation of web accessibility for a selected group of public websites in Bulgaria, 10(1), 124-160. *Journal of Accessibility and Design for All*. doi: 10.17411/jacces.v10i1.215

©© Journal of Accessibility and Design for All, 2020 (www.jacces.org)



This work is licensed under an Attribution-Non Commercial 4.0 International Creative Commons License. Readers are allowed to read, download, copy, redistribute, print, search, or link to the full texts of the articles, or use them for any other lawful purpose, giving appropriated credit. It must not be used for commercial purposes. To see the complete license contents, please visit <http://creativecommons.org/licenses/by-nc/4.0/>.

JACCES is committed to providing accessible publication to all, regardless of technology or ability. Present document grants strong accessibility since it applies to WCAG 2.0 and PDF/UA recommendations. Evaluation tool used has been Adobe Acrobat® Accessibility Checker. If you encounter problems accessing content of this document, you can contact us at jacces@catac.upc.edu.