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Article

Local Government Website Accessibility—Evidence from Poland

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Abstract: The paper investigates the accessibility of local government websites. It focuses in particular on disability, e-administration, and web accessibility standards for the visually impaired. The research involved 182 websites of local government bodies of the Małopolskie Voivodeship (Poland). It employed selected automated testing applications. The occurrence of selected accessibility tools on the websites was verified with a cognitive walkthrough. A questionnaire survey was conducted as well. Results of the automatic measurements were standardized using the unitarization method. The effort yielded an aggregate final score for each website in the form of the AAR (Aggregate Accessibility Rating). It was used to build a ranking list of the websites and order them by the accessibility criterion. The websites achieved 57.23% of the available AAR points in total. This indicates there is a great opportunity for improvement in the accessibility of the investigated websites (in the employed research design). Moreover, municipalities were found to be heavily committed to the questionnaire survey, which is indicative of the importance and relevance of the problem of accessibility and quality of public websites.

Keywords: electronic administration; accessibility guidelines; accessibility audits; e-administration; e-services

1. Introduction

Disability is an ambiguous and multidimensional notion. It involves a permanent or temporary impairment of physical or mental capacities. It has numerous consequences for individuals and society at large. It can affect virtually all functional domains (Kavale and Forness 2000). Disability is a complicated matter, and the effort to overcome the inconvenience it brings differs depending on the context. The problem of disability is expected to escalate in the years to come, mainly due to population ageing and increased incidence of chronic diseases (Wang et al. 2005; Moussavi et al. 2007).

There is no single, generally recognized definition of disability. Every attempt to define it should take into consideration the relationships between the person's health status (also sex, age, and education) and their surrounding society and environment (Hahn 1985). The World Health Organisation characterizes disability as a limitation or inability to perform activities in a way or to the extent considered natural for a human due to damaged or impaired functioning of the body (Federici et al. 2017).

Disability is usually perceived from the point of view of difficulties people with disabilities have with everyday functioning in the society (family, professional, sexual, or social life) and through the inconveniences caused by the maladjustment of their surroundings, in particular in terms of architectural barriers (Wolniak et al. 2016). These are not, however, the only barriers people with

disabilities come across. Impediments, mainly technical, are common in the virtual world as well (Al-Khalifa et al. 2017).

The virtual reality of computer networks made its way into the everyday life of societies. It offers new opportunities, but there are many who cannot grasp them fully. Websites and web applications are also often beyond the reach of people with disabilities. It can contribute directly to problems with using online services (Ismailova and Inal 2017).

Electronic services (e-services) can significantly improve the quality of life of people with disabilities. Such services are provided both on the commercial basis and by public bodies, usually online using information technology and in public telecommunications networks. The user does not need to have special software or be present at the site (Sá et al. 2016).

As computer techniques and tools develop dynamically, and the number of web applications grows, the importance of the problem of accessibility grows as well. Considering the undeniable role of websites in the success of interactions between citizens and governments, evaluating e-government web sites is a worthwhile topic (Dahooie et al. 2020). The objective of the paper is to assess the accessibility of local government websites in the Małopolskie Voivodeship in terms of applicable standards and regulations. Furthermore, an attempt was made to assess organizational solutions contributing to the high quality and accessibility of local government websites.

The article poses three research questions:

- Have municipalities in the Małopolskie Voivodeship made an effort to adapt official websites to the needs of people with disabilities?
- What is the credibility of automated (logarithmic) assessment, and is the automatic assessment of accessibility sufficient?
- What organizational actions contribute to the improvement of the accessibility of local government websites?

2. E-Administration

Information is heavily used in the information society as part of the economic, social, cultural, and political life. The information society is a society capable of using the IT infrastructure and information and knowledge resources to pursue collective and personal goals in an effective and efficient way.

More and more everyday activities today take place in the web, where the number of various websites and web applications grows. It is not only because of the commonness of new computer techniques and tools, but also mobile devices connected to the Internet.

Setting aside entertainment applications, programs that help get business done, also with public administration, are increasingly popular. Others, such as social media, messengers, or forums help build social relations (Magro 2012; Lee et al. 2016). Others still, foster education (Król 2018). Today, young people live in an ever-changing world of electronic media. The young generation considers the web an integral part of reality.

IT infrastructure is successfully used by business and public sector both. The use of information technologies and proper management of the technologies can contribute to the revival of business processes, streamlining of the decision-making process, and establishing a competitive edge (Ebrahim and Irani 2005). Electronic administration is no longer just an option. It has become a must for any state seeking improved administration. People and politics play the central role in the success of e-administration, but technology is just as important (Gupta and Jana 2003).

Electronic government encompasses all government roles and activities, shaped by information and communications technologies (ICTs). Going well beyond analogies to e-commerce, it encompasses the four domains of governance and public administration: The state's economic and social programs; its relationships with the citizen and the rule of law (e-democracy), its internal operations, and its relationship with the international environment (Brown 2005). E-government is defined as a way for governments to use the most innovative information and communication technologies, particularly websites and Internet applications, to provide citizens and businesses with more convenient access

to government information and services, to improve the quality of the services, and to provide greater opportunities to participate in democratic institutions and processes (Fang 2002). The public value of e-government is understood as citizens' expectations from e-government (Twizeyimana and Andersson 2019). Financial position of a nation and its e-readiness level influence the level of e-government adoption (Glyptis et al. 2020). Information technology has become one of the core elements of managerial reform, and electronic government may figure prominently in future governance (Moon 2002).

The implementation of electronic administrations aims at simplifying and improving the relationships and transactions between public organizations and their users and citizens (García-Sánchez et al. 2011). In their evolution, three stages can be identified: E-government, e-governance (entrepreneurial approach), and e-democracy (participatory approach) (Riley 2001). These three electronic administration stages generate cost reductions, derived from the use of new and more efficient technologies, the rationalization of processes, and finally, an improvement in image (Frías-Aceituno et al. 2014).

Poland has seen dynamic changes in economic dealings, social processes, and public attitudes towards such phenomena as computerization, entrepreneurship, or social care. Access to information and electronic administration play an essential role in the ongoing transformations. Innovative information and communication technologies employed to facilitate access to electronic public services grow more important.

Regional and local governments play a particular role in shaping electronic administration as the electronic economy develops dynamically. Local government administration provides public services and is, therefore, familiar with local problems and needs of residents (Erakovich and Kolthoff 2016; Bertot et al. 2016). They serve an essential role in the development of electronic administration. One of the goals they should pursue is to facilitate access to electronic public services for citizens and business. The same applies to websites of municipal administration.

The primary tool for electronic administration is the website. It can be an official noticeboard, a regional information portal, or an e-administration platform if sufficiently sophisticated (Veeramootoo et al. 2018). A website should be built with the needs of people with disabilities in mind (Chiner et al. 2017; Sohaib et al. 2017).

3. Internet without Barriers—Website Accessibility

Website accessibility is particularly important for the elderly and people with disabilities such as the blind, visually impaired, motorically challenged, hard of hearing, deaf, dyslexic, or dysfunctional in any way (Ismailova 2017). An accessible website allows people with disabilities independent, full or limited, safe, and effective access to content and functionalities, taking into account the nature of work of various user groups.

In a broader sense, website accessibility can mean: (1) The possibility to browse content comfortably, regardless of physical limitations (web accessibility) (Vollenwyder et al. 2019), (2) search engine visibility (SEO visibility, also known as search visibility) (Härting et al. 2016), (3) social media visibility (Bronner and de Hoog 2019), and (4) web availability (Rogers et al. 2017). These attributes make up website usability (Figure 1).

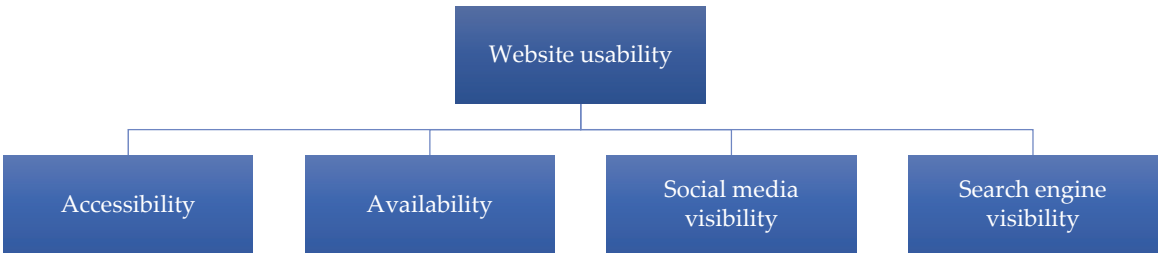

Figure 1. Ways website accessibility can be perceived. Source: Own work.

Website accessibility depends in no small extent on the technique used to create it and skills and knowledge of editors who publish content. Website availability emerges from the structure, which facilitates full, independent, safe, and effective access to content and functionalities, and takes into account the nature of work of various user groups (Yoon et al. 2016). Website accessibility means the degree to which it can be perceived, understood, and viewed by all users, regardless of their traits, limitations, and the software and hardware they use (Cao and Loiacono 2018; Hassouna 2020). The Internet without barriers is a communication space not hindered by sex, age, culture, or disability.

Web Accessibility Standards and Guidelines

The World Wide Web Consortium (W3C) proposed guidelines for designing and publishing content online to improve its accessibility for people with dysfunctions in 1999 (Web Content Accessibility Guidelines, WCAG). The file was updated in 2008 as ver. 2.0. In 2012, it became ISO/IEC 40500:2012 standard. WCAG 2.1 was published in June 2018.

It is hardly possible to investigate the legal aspects of web accessibility separately from the technical side of the matter. The two outlooks on accessibility interweave, co-exist, and supplement each other. WCAG is a WAI (Web Accessibility Initiative) documentation with guidelines for developers of accessible websites. Starting on 15 October 2012, the WCAG guidelines 2.0 became international ISO/IEC 40500:2012 standard. The Web Accessibility Initiative is a W3C initiative to improve broadly defined website and web application accessibility. WAI focuses on providing Internet accessibility guidelines, ensuring that network technologies support accessibility, and offering education. W3C is an international organization of over 400 stakeholders. W3C provides standards for writing and transmitting websites. Technical specifications and guidelines by W3C are not acts of law, but are respected by website developers all over the world.

Web content accessibility guidelines WCAG 2.1 contain recommendations regarding website creation. Implementation of WCAG 2.1 can improve website accessibility for a broader user base, including people who are blind or visually impaired, deaf and hard of hearing, people with learning issues and cognitive limitations, motorically challenged, people with speech disorders, light sensitivity, and those suffering from complex disabilities.

WCAG 2.1 is founded on four principles of accessibility. Content has to be perceivable (information and user interface components must be presented in a way that they can be perceived); operable (user interface components must be usable); understandable (information and the operation of user interface must be understandable); and robust (content must be published with care so that it can be interpreted reliably) (WCAG 2020). The principles are made up of twelve guidelines that define basic objectives for designers and editors of websites. Conformity with the guidelines is measured with success criteria. Most of the guidelines can be met at three levels of conformance: Basic (A), extended (AA), and full (AAA). Conformity with the WCAG 2.0 standards for telecommunication systems became required by the Polish law in April 2012 (Regulation 2012).

The robustness and reliability of the WCAG earned them international recognition. In 2006, the European Union considered it a website-design standard for member states. The WCAG 2.1 standard implemented in 2018 expanded the requirements in the guidelines and success criteria. The amendment was introduced with three groups of users in mind: People with visual and cognitive dysfunctions, and users of mobile devices.

All organizations pursuing public tasks in Poland were obliged to adapt their websites to the WCAG 2.0 AA standard starting 2015 (Regulation 2012). Accessibility criteria in Appendix No. 4 to the Regulation were mere guidelines for website developers (Zdonek and Spałek 2013); hence many websites fail to meet them. A new 2019 Act on the digital accessibility of websites and web applications of public bodies (Act 2019) provides for an 'accessibility support statement' to be published on websites or the Public Information Bulletin (BIP) as of 31 March 2020. The regulations provide for an annual review of the accessibility support statements and require that public bodies update them as well. The supervision over the accessibility of websites and web applications of public bodies is a duty of the

Minister of Digital Affairs. The Minister of Digital Affairs may impose fines as part of the supervision (Act 2019).

Specific guidelines of the Polish Ministry of Digital Affairs for accessibility support statements are updated regularly. The checklist for verifying website conformity with the Act is over 30 pages long and available as a draft. It is a source of uncertainty and doubts in public administration bodies.

It is crucial and necessary to implement new regulations for digital accessibility, but the task is far from being easy due to the small number of experts in this field in Poland (Dębski 2019). The effort should be aimed at devising a method or a set of methods for the independent assessment of website accessibility in public bodies. Another question is, to what extent public bodies in Poland have adapted their websites to the accessibility requirements in the currently applicable Regulation and how it can be investigated.

4. Materials and Methods

The study involves 182 websites of local government bodies of the Małopolskie Voivodeship. They were selected intentionally because of the structure of the region (a large number of municipalities on a relatively small area and abundant tourism and recreation possibilities) and the significant impact of the region on the economic and tourism growth in Poland. The study takes into consideration rural, urban, and mixed rural-urban municipalities. The research was conducted in February 2020.

The Małopolskie Voivodeship was established on 1 January 1999 as a result of administrative reform. It is situated in southern Poland (Figure 2) and occupies 15,183 km^2 (5% of Poland's area). The Małopolskie Voivodeship is divided into 19 rural districts and 3 urban districts (Kraków, Nowy Sącz, Tarnów) further subdivided into 182 municipalities. It is one of the smallest voivodeships in Poland (12th place), and its capital is Kraków.

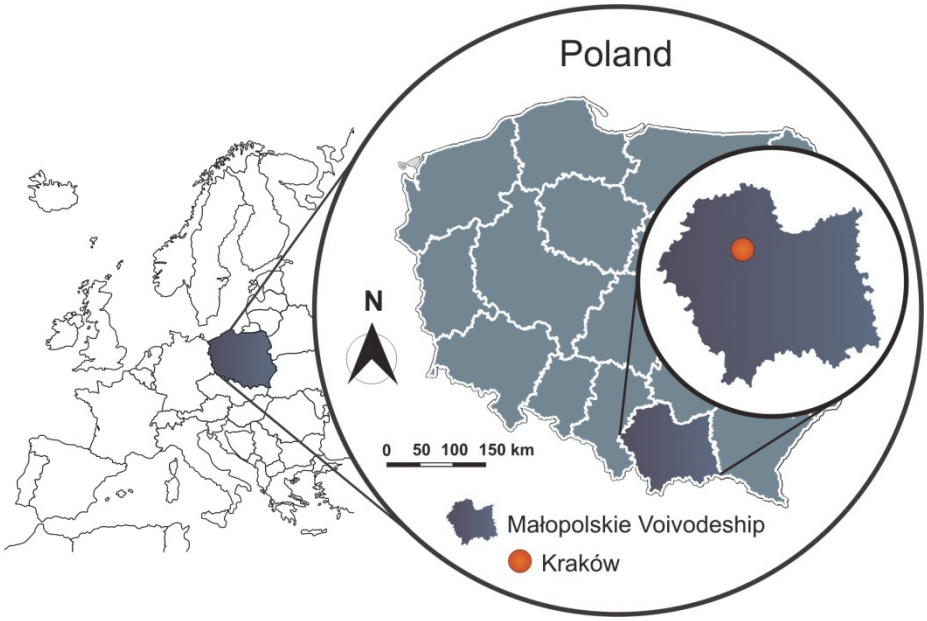

Figure 2. Małopolskie Voivodeship in Europe. Source: Own work.

Exceptional landscapes and nature, an impressive number of landmarks, and unique atmosphere bring over a dozen million tourists from all over the world to Kraków every year. This has made Lesser Poland one of the top tourist locations in Poland for years. The Małopolskie Voivodeship is the leader in the number of issued mountain guide licenses and registered hospitality facilities. Moreover, the Małopolskie Voivodeship is a leading region in Poland as regards the pace of economic growth. Lesser Poland has been among the most popular places for business and economic meetings

for years. E-administration implemented in local government bodies plays a vital role in enhancing economic growth.

4.1. Investigating Accessibility

The key to ensuring website accessibility is the conformity with technical standards such as W3C design standards, WCAG, PDF/A, and WAI-ARIA standards (Web Accessibility Initiative—Accessible Rich Internet Applications). The research focused on the assessment of website perception according to the WCAG, their conformity with the W3C design standards, and usability on mobile devices. Moreover, the authors further focused on website accessibility in terms of electronic interaction with the target citizen group, A2C (administration-to-citizen).

The research was divided into three stages (Figure 3). The first stage was to perform automated tests of accessibility parameters with selected tools recommended by the W3C (Table 1). The tests were performed in a browser window. They yielded an end-report and a synthetic score, which reflected website conformity with test parameters.

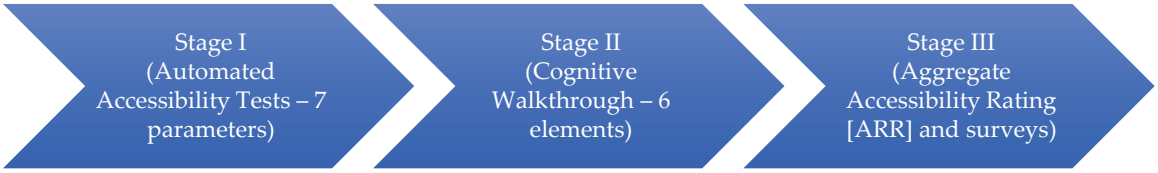

Figure 3. Research stages. Source: Own work.

Table 1. Tools used for automated accessibility testing.

Test Tool	Test Specification and Scope
Utilitia https://validator.utilitia.pl	A website accessibility validator for WCAG and W3C standards conformity. Fully automated test.
WAVE (WV) https://wave.webaim.org	Website accessibility analysis. Hotspots flagged with icons.
Lighthouse (Google Developers)	A component of Google Chrome. Recommended by Google.
Functional Accessibility Evaluator (FAE) https://fae.disability.illinois.edu	The application runs web conformity tests for the ARIA 1.0 and W3C (HTML5) standards.
Opera Mobile Emulator (desktop)	Website mobile conformity. Fully automated test. The application emulates website viewing on the most popular mobile devices.

Source: Own work.

The second stage of the research involved an in-depth assessment of the home page of each investigated website using a cognitive walkthrough. This step provided information on whether the contrast and font size could be changed or a search panel and sitemap were available. Their usability was verified as well; the authors looked into how specific features were implemented and whether it had a tangible impact on website clarity, such as whether the contrast and font icons were of the right size and positioned to be easily spotted. Website usability on mobile devices was verified as well.

The third stage involved a survey questionnaire. The electronic questionnaire was sent using mail merge to local government bodies in the Małopolskie Voivodeship. The form consisted of ten questions. The survey focused on issues related to the creation and administration of the authority's official website. The respondents were asked to react to statements on organizational components affecting the quality and accessibility of a website. They could also express their opinions regarding technical and organizational aspects affecting municipality website quality and accessibility.

4.2. Research Tools

The research involved five applications: (1) Utilitia, (2) WAVE, (3) Lighthouse, (4) Functional Accessibility Evaluator (FAE), and (5) Opera Mobile Emulator. Note that there is a multitude of tools for automated accessibility testing. Some of them can be found on the W3C's recommendation list Web Accessibility Evaluation Tools List (2020).

Apart from typical barriers for information access according to the WCAG, Utilitia checks website conformity with W3C design standards for HTML and CSS specifications. Utilitia yields a general and detailed report and a score from 0 to 10 (Table 2). Utilitia was created under the project to build a system of automated web accessibility audits, OpenAudit co-funded by the European Union's European Regional Development Fund under the Innovative Economy Operational Programme.

Table 2. Website accessibility level according to Utilitia.

Website Accessibility Level	Score
Website inaccessible	below 5, (0;5>
Website significantly inaccessible	5 to 6, (5;6>
Website moderately inaccessible	6 to 7, (6;7>
Website accessible with minor problems	7 to 8, (7;8>
Website accessible	above 8, (8;10>

Source: Own work based on (Król 2016).

WAVE is a web application, which helps assess website accessibility. The tool flags with icons website components identified as responsible directly for accessibility. Functional Accessibility Evaluator (FAE) analyses websites and verifies their conformity with the WCAG. The tool indicates objects that need to be amended to meet accessibility standards. Tests with WAVE count accessibility and contrast errors.

Lighthouse (Google Developers) is activated in Google Chrome's toolbar. Two variants of tests, desktop and mobile, are conducted in the browser window for performance, accessibility, and SEO (Search Engine Optimisation) attributes. Test results are presented as a score from 0 to 100 points.

Automated accessibility tests were expanded to include responsiveness, i.e., Website usability on mobile devices. The responsiveness tests were carried out in the Opera Mobile Emulator. Responsive Web Design (RWD) is a design approach that puts the user's needs and viewing comfort first. RWD involves adapting the content of a website to the device it is viewed on while maintaining image quality and simplicity of navigation (Bernacki et al. 2016).

Values of thirteen attributes in total were recorded. They were then standardized using zero unitarization. This method can aggregate any number of variables with values in different units (Król 2019). Considering that the variables adopted used in the analysis were of different natures, one formula (1) was applied for stimulant variables (S), and another formula (2) was used for inhibitor variables (D) in the unitarization process.

$$z_{ij} = \frac{x_{ij} - min_i\{x_{ij}\}}{max_i\{x_{ij}\} - \min_i\{x_{ij}\}} \tag{1}$$

$$z_{ij} = \frac{max_i\{x_{ij}\} - x_{ij}}{max_i\{x_{ij}\} - \min_i\{x_{ij}\}} \tag{2}$$

$i = 1, 2, .., n; j = 1, 2, ..., m,$
z_{ij}—standardized diagnostic variable,
x_{ij}—non-standardized diagnostic variable,
$min_i\{x_{ij}\}$—the minimum value of the non-standardized diagnostic variable,
$max_i\{x_{ij}\}$—the maximum value of the non-standardized diagnostic variable.

For variables that are stimulants, the measured value should be as large as possible (such as the number of satisfied accessibility conditions). Inhibitors should have as low values as possible (such as accessibility errors). Standardized attribute value ranges from 0 to 1. Next, the values of variables were totaled. This yielded an aggregate final score for each website (Aggregate Accessibility Rating, AAR). The research involved 13 attributes so the AAR ranged from 0 to 13 points.

5. Results

The investigated websites were poorly scored by Utilitia. Almost 60% were evaluated to be 'inaccessible for people with disabilities'. Another 34% were tested to be 'significantly inaccessible' (Table 3). Merely a little over 6.5% were scored positively.

Table 3. Website accessibility level according to Utilitia.

Website Accessibility Level				
Website inaccessible Below 5 pts (0;5>	Website significantly inaccessible 5 to 6 pts (5;6>	Website moderately inaccessible 6 to 7 pts (6;7>	Website accessible with minor problems 7 to 8 pts (7;8>	Website accessible Above 8 pts (8;10>
Number of websites by points				
108	62	0	12	0
Percentage (%)				
59.34	34.07	0.00	6.59	0.00

Source: Own research.

About 69% of the websites offered an option to change content contrast. Contrast changing tools usually can change the font size as well. About 66% of the websites had such a tool. The search panel was the most popular tool. Fifty-seven websites had a sitemap (Table 4). Almost 70% of the websites could be easily viewed on mobile devices. These websites were modern, frequently updated, and prepared with mobile devices in mind. Such websites served a representative and marketing function. Contents were presented in a dynamic and interactive manner with attractive graphics, frequently using professionally edited photographs.

Table 4. Facilities for people with disabilities.

Accessibility Criterion	Contract Change	Font Size Change	Search Panel	RWD	Sitemap
Number of websites with the facility	125	120	129	126	57
Percentage (%)	68.68	65.93	70.88	69.23	31.32

Source: Own research.

The maximum aggregate score (AAR) was 13 points. About 64% of the websites had the AAR of at least 7 (about 54% of the maximum score). It is a satisfactory result, although the set contains a significant number of websites evaluated to be inaccessible (in the employed research design) (Table 5).

Table 5. Number of websites by the AAR value.

AAR value	3.00–4.99	5.00–6.99	7.00–8.99	9.00–9.99	10.00–10.99
Number of websites	22	42	80	31	7
Percentage (%)	12.09	23.08	43.96	17.03	3.85

Source: Own research.

The lowest recorded AAR value was 3.03 (23.3%). The highest value was 10.93 (84.07%) out of 13. The total website score was 1354.271 out of 2366, which is 57.23% of the maximum score. This indicates that there is an excellent opportunity for improvement in the accessibility of the investigated websites.

The most common accessibility problem was incorrect background-to-text contrast, such as beige text against a brown background or light-grey text against a white background. The authors noted improper background for text such as images, photographs, or mosaics, which obfuscated the text and required concentration of the eyesight. Moreover, a small font such as 11 px was often identified. All these inconveniences can significantly limit the comfort of website browsing, not only for people with impaired sight, but also for the elderly or regular users.

Survey Results

The respondents were classified into three groups depending on the website quality measured with the ARR (the best websites [Top 50], the worse websites [Bottom 40], and [Other]). The authors invited 182 municipalities to participate in the survey. They received responses from 84 of them, which is about 46%.

The response rate for municipalities with websites in Top 50 was 66%. The response rate for municipalities with the lowest ARR values (Bottom 40) was 45%. The response rate for the other municipalities was 36% (Table 6).

Table 6. Questionnaire form response rate.

Website Type in Terms of the ARR	Top 50	Bottom 40	Other	All
Invitations sent	50	40	94	182
Responses	33	18	33	84
Percentage (%)	66%	45%	36%	46%

Source: Own research.

Most municipalities that participated in the questionnaire survey confirmed that the number of visits to the local government administration website increased in the recent 2 to 3 years. About 63% of the municipalities had their websites designed by interactive agencies. In 74% of cases, the website was administered by a single employee or a team of authorized employees. Only 7% entrusted a third party, such as an interactive agency or other IT contractor with the task. The same applied to the implementation of new technical solutions. Only 24% of the participating municipalities outsourced the job to experts. Other bodies had municipality employees install new components (Table 7).

The following people responded to the questionnaire questions: 41 employees of IT or similar departments, 21 employees of promotion or similar departments, 7 employees of a department other than promotion or IT authorized to update and maintain administration's website, and 11 public administration managers. Four more respondents were not employees of the administration, but administered the website under civil law contracts.

Most public administration employees (at various organizational levels) who participated in the survey believed that the municipality website had to be designed by an expert company to be of high quality. Content management should be entrusted to administration employees (Table 8).

The vast majority of participating municipalities (93%) would attempt to obtain or secure in their budgets funds to develop and maintain electronic communications channels. Ninety percent of the respondents firmly believed it was beneficial to have one person in the municipality administration responsible for managing (coordinating) all work related to electronic communications channels (Table 9).

Table 7. Selected results of the questionnaire survey: 'Initial state analysis' (n = 84).

Question	Top 50	Bottom 40	All	Top 50—Bottom 40
Has the average number of visits to the municipality website grown in the recent 2 or 3 years?				
Definitely YES, YES	88%	72%	84%	16%
Other responses	12%	28%	16%	–
Who designed the current municipality website in technical and functional terms?				
A third party	55%	66%	63%	11%
A team of authorized employees of municipality administration and a third party	30%	22%	11%	8%
Other responses	15%	12%	26%	–
Who is currently responsible for updating and posting content on the website and in social media?				
A team of authorized employees (2–3 persons)	51%	50%	42%	1%
One authorized employee of the municipality administration	27%	22%	32%	5%
A team of authorized employees of municipality administration and a third party	6%	11%	7%	5%
Other responses	16%	17%	19%	–
Who is currently responsible for updating and introducing new technical and functional modules to the website and in social media?				
One authorized employee of the municipality administration	33%	33%	32%	0%
A team of authorized employees (2–3 persons)	18%	16%	14%	2%
A team of authorized employees of municipality administration and a third party	21%	5%	6%	16%
A third party	18%	22%	24%	4%
Nobody introduced new technical or functional solutions after the website was designed. There is no need	0%	11%	4%	11%
Other responses	10%	13%	20%	–

Source: Own research.

Table 8. Survey results: 'Website quality assurance' (n = 84).

Statement	M	P	T	I	All
I believe that in order to ensure the high quality of the municipality website, it should be designed by:					
A third party	55%	75%	100%	62%	66%
Person(s) employed at the administration (as part of their duty)	9%	10%	0	3%	10%
Person(s) employed at the administration (under a civil law contract)	0%	0	0	8%	6%
Other responses					
I believe that in order to ensure the high quality of the municipality website, its content should be updated by:					
A third party	0%	0%	25%	7%	5%
Person(s) employed at the administration (as part of their duty)	82%	68%	25%	59%	50%
Person(s) employed at the administration (under a civil law contract)	9%	25%	50%	21%	27%
Other responses					
I believe that in order to ensure the high quality of the municipality website, new technical and functional solutions should be introduced by:					
A third party	36%	57%	100%	56%	56%
Person(s) employed at the administration (as part of their duty)	19%	18%	0%	12%	15%
Person(s) employed at the administration (under a civil law contract)	9%	8%	0%	10%	8%

M—I am a public administration manager; P—I am an employee of a promotion, similar or another department; T—I am a third party responsible for the municipality website; I—I am an IT or similar department employee; Source: Own research.

Table 9. Survey results: 'organizational solutions' (n = 84).

Statement	Types of Responses		
I believe that in order to ensure high quality and accessibility of the municipality website, the following are necessary:	Definitely YES; YES; Probably YES	Don't know; Uncertain	Definitely NO; NO; Probably NO
Obtain or ensure funds to develop and maintain electronic communications channels	93%	6%	1%
Have one person in the municipality administration responsible for managing (coordinating) all work related to electronic communications channels	90%	5%	5%
Appreciate the effort put into the promotion and quality of the website	94%	6%	0%
Have one person in the municipality administration (such as an IT technician) responsible for the website as one of their duties	25%	24%	51%
Conduct a website audit by a third party once every two years	67%	23%	10%
Cooperate continuously and regularly with a third party regarding website accessibility	68%	19%	13%

Source: Own research.

The respondents did not favor having one person responsible for all work on the website. Sixty-seven per cent of the municipalities that participated in the survey would have a third-party expert conduct periodic website accessibility audits.

6. Discussion

Website usability and accessibility research is done all over the world, including for government websites in such countries as Sweden (Gulliksen et al. 2010), Italy (Fogli et al. 2010), Australia (Grantham et al. 2012); Czechia (Kopackova et al. 2010), Nigeria (Adepoju et al. 2016), Malaysia (Ramli 2017), Jordan (Al-Bataineh and Mustafa 2016), Saudi Arabia (Al-Khalifa et al. 2017), various public benefit organizations such as libraries (Conway et al. 2012; Kimura 2018), and businesses.

Website accessibility has significant social, legal, and economic implications. Loiacono and Djamasbi (2013) presented a study on managers from various businesses, and indicated that one of the critical factors for website accessibility was the number of IT experts in the company. Web application accessibility on mobile devices was investigated by Borys and Plechawska-Wójcik (2013). They pointed out that most tools for assessing the accessibility of websites on mobile devices were based on an automatic analysis of HTML code conformity with W3C and WCAG standards. They noted that automated tests had to be interpreted by an expert.

Zadrożny (2007) noted that the issue of website accessibility was appreciated globally much earlier than in Poland. He listed selected applications for automated accessibility testing and pointed out that a full audit should consist of three stages: Automated testing, expert testing, and tests by users with disabilities (Table 10). Dziwisz and Witek (2013) noted that tests with people with disabilities are too often skipped, and only automated tests are carried out.

Table 10. Selected types of website accessibility tests.

Test Type	Research Tools and Techniques
Automated	Using test applications—web validators, browser extensions, etc. Relatively fast and reproducible tests.
Expert	Inspections—tests by experts, usually followed by user tests.
User evaluations	Exploratory—tests with users with disabilities in line with test scenarios (also interviews and observations). Comments and opinions are noted down by the test moderator or by the auditor in a questionnaire.
Questionnaire survey	A survey questionnaire on website accessibility and usability (accessibility assessment by the administrator, officer, etc.).

Source: Own work based on (Zadrożny 2007; Zdonek and Spałek 2013).

Although public institution websites are required by law to be accessible, a study on websites of rural municipalities in Lesser Poland by Król (2016) has shown that there are still many websites that are far from conforming with current standards, archaic, maladjusted to persons with disabilities, which should be archived and replaced with new ones.

The Polish Supreme Audit Office (NIK) (NIK 2014) carried out an inspection of the implementation of selected requirements for telecommunications systems, exchange of electronic information, and Polish Interoperability Framework in the city administration in Pruszków in 2014. The inspection verified the conformity of City's websites with the WCAG 2.0 standard regarding Principle 4—Compatibility. Nevertheless, the inspection involved automated tests only using online validators of the HTML code, which experts considered insufficient (Zdonek and Spałek 2013; Zadrożny 2013). The inspection revealed that the websites did not offer functionality for adapting the content to the needs of the visually impaired. A 2015 NIK inspection (NIK 2015) covered 23 websites of 22 governmental administration bodies, including the Ministry of Labour and Social Policy, Ministry of Health, and the National Health Fund. According to the Supreme Audit Office, actions taken by the leadership of the bodies to adapt the websites to the needs of people with disabilities failed to ensure full accessibility of the websites to the extent and at the level required in Article 19 of the KRI Regulation (in Polish: Krajowe Ramy Interoperacyjności, The National Interoperability Framework) despite the three-year transition period.

A literature review revealed that website accessibility tests are usually automated and employ various web applications. This method is widespread because of low costs or no costs at all. Analysis of relevant research brings questions whether authors of website accessibility studies should give in to the temptation of scale and can the issue of accessibility assessment be marginalized? Papers often cite results of automated validation of thousands or hundreds of websites. The scale of the research is used to justify the omission of expert assessment or evaluation by users with disabilities. At the same time, their authors admit that automated testing does not always reflect the actual usability of the investigated websites.

The scale of tests with people with disabilities is entirely different. Audits by the Supreme Audit Office with experts and users with disabilities tested the usability of several or several dozen websites. It was due to the time-consuming nature of the tests and a significant number of people to coordinate.

Observations and Limitations of the Research

Website accessibility is a popular topic in Poland today. This is evidenced by changing the law, numerous research papers, audits, and inspections. Public bodies' website availability was broadly tested by public institutions, individual researchers, and various public benefit organizations such as Fundacja Widzialni [the Visibles Foundation], Forum Dostępnej Cyberprzestrzeni [the Accessible Cyberspace Forum], or Stowarzyszenie Integracja [the Integration Association].

There is no single universal method for assessing website availability for people with disabilities. The availability of technologies and tools affects methods for assessing accessibility so that they take into consideration new accessibility factors with proper weight and importance.

During the test procedure, questions arose whether there was a relationship between the size of the website, meaning the amount and variety of content (presented resources), such as text, multimedia, or extensions, and test results. Does the accessibility score depend directly on the number of website components? To answer these questions, a test website was designed with only a paragraph of bolded text. Next, automated tests were run for the website. They demonstrated complete accessibility, which is true in light of the current WCAG. This means that automated testing must not be performed mechanically, and results are relative. High-scoring websites do not always conform to accessibility requirements and vice versa. Website accessibility score from automated tests can depend on its complexity or sophistication of its structure, as these factors affect the probability of coding mistakes and make it more challenging to make the code conform to design standards. The research shows that the more content is presented on a website and the greater its diversity, the harder it is to ensure accessibility.

The use of only automated testing in accessibility audits may lead to the local governments considering website accessibility as another requirement, which has to be satisfied at the lowest possible cost.

Websites of some public bodies in Poland, of both central and local government, remain poorly accessible or exhibit partial accessibility despite the KRI Regulation. Empirical studies show, however, that website accessibility regulations for public bodies and audits by NIK bear fruit. Websites of organizations providing public services are more often and better adapted to the needs of people with disabilities than business websites.

Regulations on the accessibility of business websites could focus on the evaluation and certification (marking) of those entities that ensure the accessibility of their websites to promote them. Polish legislation is yet to see such regulations. This gap is filled in by NGOs such as the Integracja foundation, which certifies websites as 'Serwis bez barier' [website without barriers] following an accessibility audit. It is a confirmation of the digital accessibility of the website or web application. The questionnaire survey confirmed that external appreciation of the effort put into accessible and good-quality content is an important motivator for public administration.

By ignoring the problem of accessibility, businesses do not face legal consequences, but may suffer from business and marketing consequences. The accessibility of a website is strongly affected by the design technique, which may impact its visibility in search results and target conversion.

The public has to be educated and made aware of the needs of people with disabilities. It is suggested to introduce regulations for education on accessibility, including modification of curricula, in particular for such university courses as IT, programming, design engineering, construction engineering, or architecture where people who design items of every-day use, public space, and cyberspace are educated. The question arises whether the education should be compulsory or voluntary, and whether the matter should be left for faculty didactics and students' boards to decide or should it be regulated by legislation.

7. Conclusions

Municipalities in the Małopolskie Voivodeship made an effort to adapt official websites to the needs of people with disabilities. In most cases, users were given tools to change contrast or font size. It is, however, not enough. Problems with content accessibility arise at the stage of website management. It is much harder to ensure the accessibility of published files, including PDF (Portable Document Format) files, and it requires greater effort from public administration employees. The every-day use of websites requires particular 'vigilance' so that all, or key, content is accessible. People who manage content need to be competent and trained.

Content on public administration websites has diverse forms and formats. Many of them had 'multitude of moving components' and were full of embellishments. The real challenge is text in grey, which substantially limits accessibility. All this can be utterly unclear to a visually impaired person.

Public administration websites often put form over substance and were 'content overloaded'. They were full of additional elements such as online calendars, weather forecasts, weather data, or intricate graphics carousels, which are not necessary and may obfuscate the critical content, bring chaos and noise, and extend load time. It seems justified to introduce central systems, which will unify how general official information is presented, and at the same time, facilitate custom design solutions and layout templates. The solutions could resemble those from social media or open-access content management systems. This way, public administration employees could focus on content instead of technicalities.

The exploration of websites of public administration bodies from the Małopolskie Voivodeship indicated that some of them were designed recently using European Union funds. They have a modern appearance, are responsive, and conform to at least basic accessibility recommendations. On the other hand, the number of websites at variance with the current standards, which are archaic and need to be archived and replaced, is enormous. The central and local governments still have much to do to improve website availability. The problem is not only the design technique, but also education, organization, and management. A repetition of the study in a few years will enable the observation of trends in the improvement of the local government websites accessibility.

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