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Abstract: Ensuring accessibility to governmental services is an essential issue to disabled people, especially to services such as the public prosecutor's office, in charge of surveillance of other governmental entities. This study investigated whether public prosecutors' websites are following web accessibility guidelines. The authors evaluated the websites of each of the 27 states of Brazil using the Web Content Accessibility Guidelines 2.0. The results indicated that the websites violated between 16 and 33 different success criteria out of 61 criteria. The results can help the agencies improve their accessibility and show the need to build the capability to perform technical analysis of the adherence to accessibility guidelines of governmental and private websites bounded by Brazilian legislation. By enhancing surveillance, e-government services could reach better accessibility levels and increase awareness about legal requirements.

Keywords: accessibility; Brazilian Government; public prosecutor's office; accessibility surveillance; digital accessibility policy; web accessibility evaluation; disabled people; Brazil.

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1 Introduction

The critical role that the web plays in the lives of citizens raises the concern to guarantee equal access to all people. However, several public websites have posed accessibility barriers that make it difficult or impossible for people with disabilities to use them (Agrawal et al., 2021; Goodwin et al., 2011; Kuzma, 2010; Olalere and Lazar, 2011; Wentz et al., 2014; Yu and Parmanto, 2011; Nakatumba-Nabende et al., 2019; Lazar et al., 2013; Lazar, 2019; Shi, 2007). Many countries have begun to promote accessibility for people with disabilities (Hong et al., 2007).

The USA is among the pioneer countries in enacting Section 508 as an amendment to the Rehabilitation Act in 1998. Section 508 establishes the obligation of information and communication technologies developed or purchased by federal agencies to be accessible to persons with disabilities (Jaeger, 2004, 2006).

In 1999, the W3C – World Wide Web Consortium created the first version of accessibility guidelines for Web content, called WCAG – Web Content Accessibility Guidelines (WCAG) (Chisholm et al., 1999). WCAG is the leading worldwide reference on accessibility on the web (Lazar et al., 2015).

In 2006, the United Nations adopted the International Convention on the Rights of Persons with Disabilities and its Optional Protocol (United Nations, 2006). This Convention aims to ensure the full and equitable exercise of all human rights and fundamental freedoms by all persons with disabilities and promote respect for their inherent dignity. The Convention stipulates that states parties shall ensure equal access for persons with disabilities to others, to media, and access to information systems and technologies.

The accessibility to public services available on the web in Brazil is a right assured to all people, derived from, among others, the constitutional principle of equality. Promoting accessibility is the duty of all society, especially public entities. Web accessibility was mandated as a requirement for websites of the federal government's executive power in 2004, by the Decree/Law 5.296 (Brazil, 2004). In 2015, the Brazilian Law of Inclusion of People with Disabilities (Brazil, 2015) was promulgated, extending the legal duty to provide accessible websites to other governmental agencies.

To ensure the realisation of this right, the Brazilian State has created standards and policies for accessibility. However, such standards have not been observed in many Brazilian governmental websites (Oliveira and Eler, 2017; Silva and Rue, 2015; Oliveira and Souza, 2017; Luján-Mora et al., 2014; Serra et al., 2015). In this way, the realisation of the right to accessibility has become a distant reality for people with disabilities. Lack of accessibility to digital government websites has also been observed in several other countries, such as the UK (Kuzma, 2010), the USA (Jaeger, 2004; Olalere and Lazar, 2011; Wentz et al., 2014; Yu and Parmanto, 2011), China (Shi, 2007), Uganda (Nakatumba-Nabende et al., 2019), India (Agrawal et al., 2021) and others.

For Lazar et al. (2015), while government policies and regulations seek to encourage or require Information Technology to be accessible, they are generally inefficient. This ineffectiveness is because of the way they are implemented, often with limited effectiveness. Thus, accessibility is not restricted to the technical aspect but also organisational policies and approaches. The role of government is key to making accessibility standards and policies observed by web portals.

Several studies have sought to identify barriers to digital accessibility on government websites. However, more knowledge is needed to understand how to enact the public power and law enforcement to comply with the accessibility requirements mandatory and with legal competence to impose the adjustments. In Brazil, the body responsible for protecting and defending society's interests and for the defence of the legal order is the Public Ministry. Therefore, this research's methodological approach elected the public prosecutor's office's websites of the states of the Brazilian federation to be inspected and to verify if they fulfil and meet the accessibility recommendations. Understanding the compliance of the public prosecutor's websites to accessibility requirements is very important to understand this organ's ability to fulfil its competence to demand compliance and adequacy to accessibility standards of other government agencies and for being the entity responsible for defending citizenship interests and promoting social inclusion. In a brief and specific topic, the functions and the relevant role of the public prosecutor office in Brazil and several countries are addressed so that the reader can understand the relevant role of this institution, present in several countries, for the effectiveness of the legal norm, defence of citizenship and social inclusion.

This way, the paper pursued the following research question:

“Do Brazilian Public Prosecutor's websites adhere to web accessibility guidelines, as evidence of the surveillance body's ability to oversee the observance of Brazilian accessibility laws by other public agencies?”

This research involved an interdisciplinary team, with researchers with a computer science and law background to answer this research question. Computer science researchers were in charge of performing evaluations of the pages containing forms to file manifestation in the public prosecutor's office's websites of each of the 27 states of the country and from the federal stance, from March to May 2017, using the WCAG 2.0

(Caldwell et al., 2008). Law researchers contributed to framing a legal discussion regarding the socio-legal factors and implications of the lack of accessibility in the public prosecutor's office's websites and an indication of a lack of technical capability to perform their surveillance duties to oversee the accessibility of other governmental websites.

This paper is organised as follows. Section 2 presents a contextualisation regarding the role of the public prosecutor's office in Brazil. Section 3 details the methods used to perform the accessibility inspections and sampling of the websites. Section 4 presents the results from the inspections and the main accessibility problems identified. Section 5 presents the discussion of legal and policy implications of the results. Finally, Section 6 presents conclusions and future work.

2 The role of the public prosecutor's office in Brazil

The public prosecutor's office in Brazil (Ministério Público) has a very relevant role, as an institution established in the Brazilian Federal Constitution for the defence of the juridical order, the democratic regime and the unavailable social and individual interests. Through oversight of the actions and omissions of public entities, especially concerning the diffuse and collective rights of persons with disabilities, it is the public prosecutor's office's responsibility to use their judicial and extrajudicial conflict resolution instruments to implement the full web accessibility to people with disabilities. It is up to the public prosecutor's office to make this right not only a guarantee in law but also a reality in users' lives.

To enable the reader to understand how the public prosecutor's office is acting in Brazil, it is relevant to mention that this institution is present in several countries. However, each country has shaped their institutions according to their particularities, making it impossible to establish a universal concept (Macêdo and de Ogrizio, 2016). In this sense, this paper presents brief points on how the countries that have their public prosecutor's office or similar institutions have conceived them.

The Brazilian public prosecutor's office has undergone numerous changes since its inception. With the advent of the Federal Constitution of 1988, the public prosecutor's office became an autonomous institution, permanent and essential to the state's jurisdictional function (Brazil, 1988). This entity was created to enable the performance of public order norms, whether of a criminal or civil nature (Liebman, 2005).

Concerning the prosecutorial performance of the public prosecutor's office, the entity has the power to propose public civil action and collective civil action for the protection of diffuse and collective interests, also called trans-individual interests. In this way, the institution acts in defence of fundamental rights, individual and collective, which are constitutionally protected. The public prosecutor's office also has exclusive ownership to file a public criminal action. Besides, it exercises the role of a prosecutor of the law, in which although not being a party in the process, the public prosecutor may intervene in the process as the law's watchdog. It is worth mentioning that the Brazilian Federal Constitution mentions the divisions of the Federal, State, District and Territorial Public Ministry (Macêdo and de Ogrizio, 2016).

There are other equivalent bodies in countries worldwide, such as the *Ministerio Fiscal* in Spain, the public prosecutor's office in the USA, the *Ministère Public* in France, and the *Openbaar Ministerie* in the Netherlands (Ponte and Demercian, 2017).

In this sense, within this institution's scope, the Public Prosecutor's Office acts in defence of the rights of persons with disabilities through the supervision and implementation of accessibility conditions. In this scenario where government portals impose several barriers to their disabled users, especially in Brazil, it is up to the public prosecutor's office to take the necessary legal measures so that public entities can make their portals accessible to all, without distinction.

In Brazil, the public prosecutor's office may act *ex officio* or through provocation. Thus, the public prosecutor's office may formally request compliance with accessibility standards by government portals independent of provocation. However, given this lack of accessibility in government portals, it is fundamental that society expands social control and report to the public prosecutor's office the problems encountered.

3 Methods

3.1 Study design

This article sought to analyse whether the pages of manifestation form of the websites of the federal public prosecutor's office and public prosecutor's office of each of the 27 states are accessible to people with disabilities. To do so, the authors evaluated the public prosecution sites of the states' pages from March to May 2017. The prosecuting page of the federal public prosecutor's office was subsequently evaluated in June 2017. It is worth highlighting that the sites may have been updated since the date of these evaluations. To ensure this study's reproducibility, all pages were saved in the version in which the test was performed.

We performed the evaluations following the recommendations provided by the World Wide Web Consortium's Web Accessibility Initiative (WAI-W3C) (Web Accessibility Initiative, 2011), including the use of automated tools to support automatic verifications of HTML and CSS validity, automated verification of adherence to WCAG's success criteria, and careful manual examination of the web pages interfaces and source code to perform WCAG's tests of conformance to success criteria.

3.2 Sample

The evaluation was conducted only on the manifestation form pages because the study is restricted to how a disabled user can perform a manifestation. Table 1 lists all evaluated sites.

Table 1 Evaluated websites

<i>Name</i>	<i>Region</i>	<i>Initials</i>	<i>Website URL</i>
Federal	-	MPF	http://aplicativos.pgr.mpf.mp.br/ouvidoria/portal/cadastro.html?tipoServico=1
Acre	North	MPAC	http://www.mpac.mp.br/ouvidoria/formulario/
Alagoas	Northeast	MPAL	http://www.mpal.mp.br/index.php?option=com_content&view=article&id=2720&Itemid=135
Amapá	North	AP	http://www.mpap.mp.br/manifestacao_ouvidoria
Amazonas	North	AM	http://denuncia.mpam.mp.br/

Table 1 Evaluated websites (continued)

<i>Name</i>	<i>Region</i>	<i>Initials</i>	<i>Website URL</i>
Bahia	Northeast	BA	http://www.tag.sistemas.mpba.mp.br/taghub.dll
Ceará	Northeast	CE	http://www.mpce.mp.br/institucional/ouvidoria-geral/manifestacoes-online/
Distrito Federal	Midwest	DF	http://www.mpdft.mp.br/ouvidoriaineternet/visao/formularioEletronico.php
Espírito Santo	Southeast	ES	https://ouvidoria.mpes.mp.br/#/manifestacoes/create
Goias	Midwest	GO	http://www.mpggo.mp.br/ouvidoria/cidadao/manifestacaoCidadaoCadastro3NEW.do?idOuvidoria=7
Maranhão	Northeast	MA	https://ouvidoria.mpma.mp.br/sistema/manifestacao/cadastrar
Mato Grosso	Midwest	MT	https://www.mpmt.mp.br/ouvidoria-client/cad_manifest.php
Mato Grosso do Sul	Midwest	MS	https://www.mpms.mp.br/ouvidoria/cadastro-manifestacao
Minas Gerais	Southeast	MG	https://www.mpmg.mp.br/conheca-o-mpmg/ouvidoria/fale-conosco
Pará	North	PA	https://www2.mppa.mp.br/sistemas/ouvidoria/?action=Manifestacao.site
Paraíba	Northeast	PB	https://ouvidoria.mppb.mp.br/index.php?mod=manifestacao&op=insertFormOpen
Paraná	South	PR	http://www.falecomoouvidor.mp.pr.gov.br/ouvmp/orgaos/123/fale_ouvidor.php
Pernambuco	Northeast	PE	http://www.mppe.mp.br/ouvidoria/cidadao/manifestacaoCidadaoCadastro3NEW.do?idOuvidoria=7
Piauí	Northeast	PI	http://www.mppi.mp.br/internet/index.php?option=com_content&view=category&layout=blog&id=271&Itemid=123
Rio de Janeiro	Southeast	RJ	http://www.mprj.mp.br/cidadao/ouvidoria/faca-sua-comunicacao-aqui
Rio Grande do Norte	Northeast	RN	https://ouvidoria.mprn.mp.br:8443/ouvidoria/cidadao/termoManifestacao.do?idOuvidoria=7&origem=&destino=cadastro
Rio Grande do Sul	South	RS	https://www.mprs.mp.br/ouvidoria/formulario
Rondônia	North	RO	http://www.mpro.mp.br/web/ouvidoria/formulario
Roraima	North	RR	https://www.mprrr.mp.br/web/ocorrencias/add_denuncia
Santa Catarina	South	SC	https://www.mpsc.mp.br/denuncie/cadastro-de-manifestacoes
São Paulo	Southeast	SP	http://www.mpsp.mp.br/portal/page/portal/Ouvidoria/Formulario
Sergipe	Northeast	SE	https://sistemas.mpse.mp.br/4.5/Ouvidoria/Manifestacao/Ouvidoria.aspx
Tocantins	North	TO	https://athenas.mpto.mp.br/athenas/ouvidoria/from_/

3.3 *Accessibility inspection procedures*

To make sites more accessible and inclusive to provide access to people with various disabilities, including blindness, deafness, learning disabilities, movement limitations, and others, it is recommended that developers follow the WCAG 2.0.

There are several ways to assess the accessibility of a site, including expert inspections, user testing, automated tool testing, and developer questionnaires. Expert accessibility inspections effectively analyse a set of specific guidelines in detail to verify that certain content follows the proposed guidelines. The use of screen readers to simulate the functioning of the page with assistive technology and tools to support code analysis further contributes to the inspection's effectiveness.

Automated analytical tools are features used to detect potential breaches in the proposed success criteria and offer advantages by assisting with repetitive tasks that require a lot of specialist time if done manually. However, these tests cover only a small portion of the problems, and a more thorough analysis of the code is indispensable. Each tool uses its algorithm to determine if an accessibility violation has occurred, so some violations can be identified by one tool and not by another tool.

The accessibility inspection procedures for the selected samples were divided into three stages. In the first stage of the assessment, page navigation was performed using a screen reader to identify potential problems and how the page behaved using this assistive technology, providing the basis for the evaluator to identify critical points that would not be accessible to people with visual or motor disabilities.

In the next step, intending to assist the evaluator in identifying repetitive problems and possibly having already been identified in the previous step, the authors chose to use two tools widely used in previous works: TAW (<http://www.tawdis.net/>) and CynthiaSays (<http://www.cynthiasays.com>). Both tools enable the evaluator to submit each page under analysis for testing according to the accessibility level (A, AA or AAA) of the desired WCAG 2.0. All evaluations were performed using the AAA level. A report with possible accessibility violations was then provided to the evaluator.

Finally, the research included a manual inspection of the page, following a worksheet with all the criteria of success of WCAG 2.0, using a set of techniques to fulfil a given success criterion and pointing the instances of the problems found. The inspections were performed using WCAG 2.0 because it is an international standard, already consolidated and used as a basis for several other guidelines, such as the Brazilian e-MAG and Section 508 in the USA.

Because of the incompatibility between different browsers regarding the level of support for HTML and CSS features and to simulate various scenarios of use, inspections were performed using three distinct combinations of operating systems with web browsers and screen readers: Windows 10 with browser Mozilla Firefox 52 and NVDA 2017.1 screen reader; Windows 10 with Opera 44 browser or NVDA 2017.1 screen reader; and Debian 8.7 with Chrome 57 browser and ChromeVox extension.

To assist the evaluator in obtaining more accurate results, the authors used a set of tools. To analyse if the combination of colours used in the page elements were suitable for visual perception, meeting the success criteria 1.4.3 and 1.4.6 of WCAG 2.0, we used the extension 'WCAG Contrast Checker' of Firefox. This tool facilitates the evaluators' analysis, listing all the elements of the page that make use of colour, with their respective luminosity, allowing to identify the points where the contrast did not meet the minimum level required.

The Firefox Web Developer Toolbar extension was also used to highlight and assist in visually identifying specific HTML components (such as tables, headers, images and links). The lack or presence of specific components could indicate a possible problem, and then further analysis is required. Disabling CSS and JavaScript on the page helped verify if it was possible to use the page without a style sheet enabled. This is important because some users use their style sheets to change the page contrast or text size. Resizing the page for various resolutions and devices was also enabled by the tool.

To visually inspect the HTML code of the page in detail, the 'Firebug' (Firefox) and 'Inspect' (Chrome) tools were used, allowing evaluators to examine all elements that might have some accessibility issues. This includes verifying that the form fields have associated label elements, if the order in which the displayed content matches the order of the generated code, if JavaScript events were used to trigger actions only by mouse interaction, the use of attributes 'alt' in images, if the contents of these descriptions made sense according to the image that was being exposed, among other analyses.

Finally, to validate adherence to web standards required by guideline 4.1.1, the authors used W3C's automatic validators for HTML (<http://validator.w3c.org>) and CSS (<http://jigsaw.w3.org/css-validator>).

3.4 *Data analysis*

Data analysis of the evaluation consisted mainly of identifying the number and characterisation of problem instances identified, the most frequently violated success criteria and a critical analysis of the most critical problems to disabled users, according to the potential of preventing them from completing their tasks.

- Problem instances

A problem instance is any specific violation that one or more users might encounter on a site. An accessibility violation on the page can lead to multiple instances of problems. For example, a manifest submission page has eight form fields, all of which are not associated with a respective label and two images without alternative text. Two problems are encountered: unlabelled form fields and non-alternative text images, with a total of ten instances of problems.

- Most frequently violated success criteria

At least 16 different success criteria have been breached, reaching a maximum of 33 criteria violated. The success criteria most often violated are those that occurred in many sites and demonstrate prevalence and need for attention by the control agencies. Several criteria were violated by all sites, indicating many common and recurring problems that could be easily solved.

- Critical analysis of most critical problems to disabled users

The analysis was based on scenarios of use by users with different disabilities. It included examining the impact and criticality assessment in the reporting tasks, which are the focus of the sites.

4 Results

This section presents the main results obtained with the accessibility inspections performed on the complaints filing pages of the public prosecutor's office of the 27 states of Brazil and its federal stance. Section 4.1 presents a summary of the evaluation, with the numbers of instances and different success criteria violated. Section 4.2 the most frequently violated success criteria, and Section 4.3 discusses how the most critical problems could impact disabled people when using governmental websites.

4.1 Summary of the evaluation

All 28 sites evaluated had at least three accessibility violations at each of the three success criteria levels. There were, on average, 24 violations to the WCAG 2.0 success criteria. Table 2 presents the number of problem instances, and the number of different success criteria violated for each website. The numbers were organised according to the priority levels defined on WCAG 2.0, being levels A, AA and AAA.

Table 2 Total instances and success criteria violated

<i>Estado</i>	<i>Instances</i>				<i>Success criteria</i>			
	<i>A</i>	<i>AA</i>	<i>AAA</i>	<i>Total</i>	<i>A</i>	<i>AA</i>	<i>AAA</i>	<i>Total</i>
Federal	114	9	20	143	4	3	9	16
Acre	242	66	85	393	9	6	9	24
Alagoas	226	34	46	307	14	6	7	27
Amazonas	253	59	62	374	10	6	7	23
Amapá	1,148	53	74	1,275	9	7	9	25
Bahia	338	78	187	603	14	8	11	33
Ceará	410	112	124	646	9	7	9	25
Distrito Federal	75	21	24	120	9	5	7	21
Espírito Santo	91	20	35	146	8	5	6	19
Goiás	242	50	52	344	10	5	7	22
Maranhão	522	21	23	566	8	6	8	22
Minas Gerais	212	10	44	266	11	7	10	28
Mato Grosso do Sul	425	45	77	547	8	5	8	21
Mato Grosso	195	57	53	305	10	6	8	24
Pará	164	23	49	236	11	6	9	26
Paraíba	237	64	58	359	10	6	7	23
Pernambuco	195	40	43	278	10	5	7	22
Piauí	1,159	22	51	1,232	11	5	9	25
Paraná	274	93	128	495	13	6	9	28
Rio de Janeiro	1,171	15	52	1,238	11	7	7	25
Rio Grande do Norte	192	48	53	293	11	7	9	27

Table 2 Total instances and success criteria violated (continued)

<i>Estado</i>	<i>Instances</i>				<i>Success criteria</i>			
	<i>A</i>	<i>AA</i>	<i>AAA</i>	<i>Total</i>	<i>A</i>	<i>AA</i>	<i>AAA</i>	<i>Total</i>
Rondônia	224	41	59	324	10	7	8	25
Roraima	15	11	29	55	5	4	8	17
Rio Grande do Sul	288	84	104	476	8	8	11	27
Santa Catarina	1,380	41	61	1,482	11	5	9	25
Sergipe	243	85	89	417	11	6	11	28
São Paulo	212	28	49	289	11	8	12	31
Tocantins	37	19	40	96	11	6	7	24

4.2 Most frequently violated success criteria

The most common accessibility problems found in the 28 evaluated sites can be verified in Table 3. The problems listed are described in more detail as follows.

Table 3 Summary of the main criteria violated

<i>Success criteria</i>	<i>Sites with violations</i>
<i>Level A</i>	
1.1.1 Non text-content	25 (89%)
1.3.1 Info and relationships	28 (100%)
2.1.1 Keyboard	25 (89%)
2.4.1 Bypass blocks	24 (85%)
3.3.1 Error identification	27 (96%)
3.3.5 Help	28 (100%)
4.1.1 Parsing	28 (100%)
4.1.2 Name, role, value	26 (93%)
<i>Level AA</i>	
1.4.3 Contrast (minimum)	28 (100%)
2.4.6 Headings or labels	25 (89%)
3.3.2 Labels or instructions	27 (96%)
3.3.3 Error suggestion	27 (96%)
3.3.4 Error prevention	28 (100%)
<i>Level AAA</i>	
1.4.6 Contrast (enhanced)	28 (100%)
1.4.8 Visual presentation	27 (96%)
2.1.3 Keyboard (no exception)	25 (89%)
3.3.6 Error prevention (all)	28 (100%)

WCAG 2.0 success criterion 1.1.1 states that developers must provide a textual alternative to all non-textual content (images, controls, and form entries). The federal public prosecutor's office and the states of Roraima (MPRR) and Espírito Santo (MPES)

were the only ones of the 28 sites analysed that were successful in this criterion. All other sites contained problems related to this problem, which was observed in other studies. They all had issues with images lacking alternative text, making it impossible to identify the screen readers' element correctly. When the pages had a CAPTCHA image, they also did not offer an alternative for their reproduction, making it impossible for the user to proceed with the form's submission. The distorted codes in images to avoid 'robots' is a severe issue to blind users.

One of the most common violations, occurring on all sites and probably the most serious, corresponds to success criterion 1.3.1, in which 'Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in the text'. The most frequent violation of this success criterion was the lack of association of a label to its respective input or control field. In such cases, the screen reader can only identify the component reading as a 'text field' without informing what users would have to input. Another problem identified in some pages was the use of tables to structure the page's content, which can make reading confusing to screen reader users.

Success criterion 2.1.1 states that "All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes". Most pages that had a drop-down menu for navigation commonly use a JavaScript function that sometimes only triggers an item if the user remains with the mouse pointer over the element, violating this criterion by not allowing access to users using only the keyboard. An example of this problem can be seen in Figure 1.

Success criterion 2.4.1 states that "a mechanism is available to bypass blocks of content that are repeated on multiple web pages". One of the features that can be used to fulfil this criterion is implementing a 'go to content' link at the top of the page, usually the first link to receive focus when using keyboard navigation. Only three sites implemented this feature or a similar one.

All evaluated sites had poor colour contrast problems, causing problems for users with low vision and violation of success criterion 1.4.3. WCAG states that visual display of text and text images should have a contrast ratio of at least 4.5:1. Some of the sites reviewed provided a contrast control button, which applied high-contrast settings throughout the content. However, these were not always fully functional, usually because an iframe element was used to display the form, so the contrast was changed on only part of the page, as exemplified in Figure 2.

Guideline 4.1 states that developers should "maximize compatibility with current and future user agents, including assistive technologies". There were violations related to this guideline in all sites reviewed. The main reason for this failure is related to not using HTML and CSS elements correctly.

The intent of success criterion 1.4.8 is to ensure that content represented visually is presented so that it can be perceived without its layout interfering with its readability. One of the requirements that must be met for this criterion is to allow pages to be resized without loss of content. It should adapt to devices with smaller or larger screens and allow zooming up to 200% without scrolling horizontally to read a line of text. A website that meets these criteria can be responsive to adapting its visual presentation according to the device being used. Only two sites (MPAM and MPES) could be considered fully responsive. However, in one of them (MPAM), it was not possible to completely alter the background colour of the page. Therefore, only one site met this criterion successfully.

Another problem found in some pages was justified texts with spacing between paragraphs smaller than 1.5pt, making it difficult to read the text for users with dyslexia.

Success criterion 2.4.6 requires that headings and labels describe the topic or purpose of the content. Only two sites (MPPI and MPRR) were successful in this criterion. Instances of unlabelled form fields were also the main problems encountered at this point. On some sites, it was also common to misuse headers on the page, causing problems for many users who could use a screen reader's header navigation feature.

An input error occurs when the system does not accept user-provided information. The intent of success criterion 3.3.1 is to ensure that all incoming errors are reported and that the user can identify these. However, users with cognitive or visual impairment may not figure out how to correct the error. Success criterion 3.3.3 complements 3.3.1 by providing appropriate suggestions on how to correct an input error. Only the MPF site succeeded in these two criteria, providing users with immediate identification of the error and directing the focus to the field in which the error occurred and providing a suggestion for error correction. All other sites had instances of problems.

Success criterion 3.3.2 (labels or instructions) states that developers should provide labels or instructions that identify controls so that users know which input data is expected. Again, only the MPF website succeeded in this success criterion. Again, the most common problem found in this success criterion was the lack of label association to its respective form field.

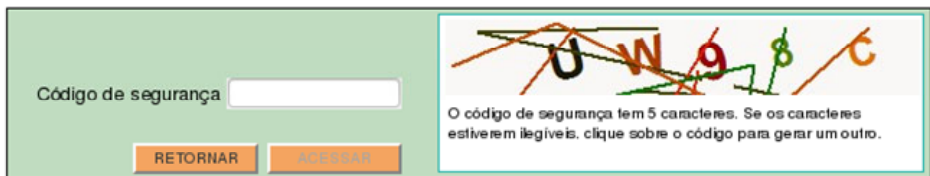
The intent of success criterion 3.3.4 is to help disabled users avoid sending error information so that severe consequences can be avoided. For example, when users click on the submit a manifestation button, it should be possible to check the data entered before sending the manifestation. In this case, as we deal with a site with legal content, this criterion was evaluated, and consequently, there were the same failings in success criterion 3.3.6.

4.3 Most critical problems that can prevent disabled users from filing a complaint

In this section, we discuss some of the most critical problems encountered by users with disabilities and how they could impact their interaction and their ability to file a manifestation to the public prosecutor's office.

4.3.1 Critical problems for blind users

Most of the pages analysed presented severe problems with the use of the forms. The page's primary purpose was not reached because the fields could not be read correctly by screen readers, usually due to the lack of association of a label. In a visual verification of the screen, it is evident that the field 'Security code' (Código de segurança in Portuguese) corresponds to the image shown next to it, but for those who use screen readers, the characters contained in the image cannot be identified. On the MPBA site, the first step to a demonstration is to fill in the Captcha shown in Figure 1. With this, a blind user would not even obtain access to the form for sending the manifestation because he/she would not be able to go past the Captcha. All the pages where a Captcha was required to be filled were inaccessible to blind users, except for the MPF alternative page.

Figure 1 CAPTCHA without textual alternative – MPBA (see online version for colours)

Also, on the MPBA website, assuming that CAPTCHA would have offered an alternative for its identification, the user would come across the form presented in Figure 2. On this page, several instances of different types of accessibility problems can be identified. None of the form fields contained an associated label identifying their purpose. This problem violates several success criteria, causing severe consequences for blind users, not allowing the form's completion to send the manifestation. This fact is because blind people would not be able to identify a particular input field's purpose.

Figure 2 New manifestation form – MPBA (see online version for colours)

To simulate the output of a screen reader, Firefox's Fangs extension shows how a screen reader would identify this page's components (Figure 3). Due to not having a label, all form fields would be read as 'Edit' only. Another common violation is the use of colour only to identify the required fields. All fields marked with a red line at the top are mandatory, but only users who see could identify this information. Besides these problems, as we can see in Figure 3, the output of the screen reader does not correspond to the content presented visually. The elements appear out of order, making the page usage even more confusing for users.

Figure 3 Simulated output of a screen reader

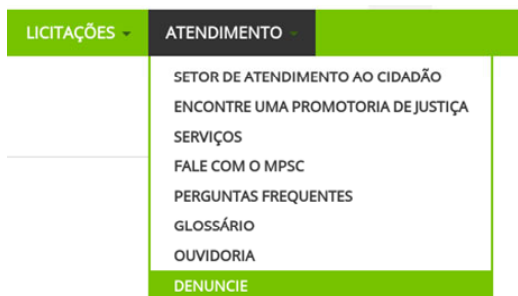
Screen reader output

TAG dash Sistema de Ouvidoria e Gestão Pública dash Internet Explorer NOVA MANIFESTAÇÃO dash IDENTIFICAÇÃO OBS. colon Os campos marcados com uma linha vermelha são obrigatórios Feminino Masculino Sexo Tipo documento Número slash emissor Combo box dash dash Seleccione dash dash Edit Autoriza SMS Celular Número Autoriza SMS Fone residencial E dash mail Fone comercial FAX UF País País, DDD e número Município Endereço CEP Bairro Complemento Radio button Not checked Sim Radio button Not checked NÃO Edit Edit Edit Edit Edit Combo box Brasil Combo box BA Combo box dash dash Seleccione dash dash Edit fifty-five Edit Edit Edit fifty-five Edit Edit Edit fifty-five Edit Edit Edit Edit Buscar endereço pelo CEP button Dados para contato Como deseja a resposta Nome Documento de identificação Tipo do manifestante Radio button Not checked Radio button Not checked Edit Combo box dash dash Seleccione dash dash Seleccione como deseja a resposta da sua manifestação. Combo box dash dash Seleccione dash dash Checkbox Not checked Desejo o anonimato Checkbox Not checked Desejo sigilo dos dados que me identificam Sair do processo de registro. button Ir para a tela seguinte. button Abrir a tela de ajuda. button Table with one column and one row Table end copyright two thousand eight Governo do Estado da Bahia dash Ouvidoria Geral Melhor visualizado em one thousand twenty-four x seven hundred sixty-eight Versão three point two point three Graphic Distrito Federal, usuário do TAG. Graphic Estado do Amazonas, usuário do TAG. Graphic Estado do Espírito Santo, usuário do TAG. Graphic Estado da Bahia, Responsável pelo desenvolvimento e manutenção do sistema TAG. Graphic Estado de Minas Gerais, usuario do TAG Sistema de Ouvidoria e Gestão Pública

4.3.2 Critical problems for users with motor and visual disabilities

Sites with a drop-down menu often present problems for users with motor and visual impairments, as shown in Figure 4. This problem is because, when implemented incorrectly, they do not allow the use of the element using the keyboard, the main form of navigation for these users. This menu uses the CSS hover function to interact with the user. The submenu is only shown if the user hovers over the desired item. Thus, there is no alternative that allows users who cannot use the mouse to access the content. Most sites that use this type of menu presented the same problem because they use the same features without any alternative that can be accessed with a keyboard.

Figure 4 Drop-down menu not accessible by keyboard – MPSC (see online version for colours)



Another pervasive problem, which also prevents the use of page resources through the keyboard, is the use of JavaScript ‘onmousedown’ events. The form shown in Figure 6 has several instances of these problems. To fill in municipality and profession’s fields (município and profissão, in Portuguese), users would need to click the button with the image of a magnifying glass next to the field. The ‘Attach Files’ (Anexar arquivos, in Portuguese) button is also only accessible using the mouse.

4.3.3 Problems for users with low vision

All analysed sites failed in success criterion 1.4.3 (contrast – minimum). Some pages provide the user with an accessibility bar where users can apply high contrast on all content. However, in all cases where this functionality was offered, it did not work correctly, as shown in Figure 5. The colours were changed correctly throughout the page, except for the form, usually because the iframe component was used, incorporating another page with its style sheet.

Figure 5 Contrast control does not work in the form area (see online version for colours)

The screenshot shows the website of the Ministério Público do Estado do Ceará (MPCE). The page is titled 'Manifestações online - Fale com a Ouvidoria'. The form is titled 'Entre em contato com a Ouvidoria do Ministério Público do Estado do Ceará'. The form fields are as follows:

- Nome: *
- E-mail: *
- Categoria: * (dropdown menu with 'Sugestão' selected)
- Data de nascimento: *
- Sexo: *
- Profissão: *
- Escolaridade: *
- CPF: *
- RG: *
- Telefone fixo com DDD: *
- Telefone celular com: *

The form is marked with several asterisks (*) indicating required fields. The form is contained within an iframe, and the contrast control is not working in this area.

4.3.4 Problems with users with low digital literacy

Figure 6 presents a form used in four sites (MPAC, MPAL, MPMS or MPSC) with several violations of the WCAG 2.0 success criteria. Several fields marked with * are required, but no caption is given indicating the meaning of this marking. When submitting the form blank, four errors are returned informing that the fields 'type, subject, municipality of fact and describe its manifestation' must be filled in, but the authors noted that other fields marked as obligatory do not return an error. Upon completing the indicated fields and again attempting the Submission, a new attention message is returned requesting the completion of the fields 'type of person, name, CPF (national identifier), sex and post code'. This problem can confuse users and make them leave the page.

Figure 6 Form example without identification of how to fill out (see online version for colours)

X Atenção

- O campo Tipo deve ser preenchido.
- O campo Assunto deve ser preenchido.
- O campo Município do fato deve ser preenchido.
- O campo Descreva a sua manifestação deve ser preenchido.

Dados da manifestação

Tipo: * Assunto: *

Município do fato: * 

Descreva a sua manifestação: *

(Restam 4000 caracteres)

Sem sigilo
 Sigiloso
 Anônimo

Dados pessoais

Tipo de pessoa: * Física Jurídica Nome: *

CPF: * Telefone:

RG: Sexo: *

Profissão:  Escolaridade:

Funcionário público

CEP: * Endereço:

Número: Complemento: Bairro:

Reside no exterior

UF: Município: 

Documentos anexos

Cada arquivo enviado pode ter no máximo 3Mb e a soma do tamanho dos arquivos não pode passar de 10Mb.

Caso queira enviar documentos, então clique no botão abaixo:



Dados para Envio

Para receber resposta, informe abaixo seu E-mail:

5 Discussion

This article reported on the evaluation of the manifestation form pages of the public prosecutor's websites of each of the 27 states of the country, from March to May 2017. The federal public prosecutor's website was subsequently evaluated in June 2017. Based on this analysis, the authors observed several accessibility problems in these pages that inhibit people with disabilities or low literacy. The results presented in the article reveal a worrying scenario.

5.1 Understanding the role of public prosecutor in Brazil

The public prosecutor's office's service in Brazil results from a long formation process of the Democratic Rule of Law in Brazil, an independent justice institution that is not linked to any state powers (executive, legislative and judiciary). According to the Constitution of the Federative Republic of Brazil, in its Art. 127, the Public Prosecutor's Office is a permanent institution (which cannot be extinguished), which has administrative, budgetary and functional autonomy, being independently responsible for managing its financial and personal resources. Institutional independence is essential for the Public Prosecutor's Office to exert the control of state powers because, in case of any subordination, their performance and actions could be understood as partial or questionable.

The Public Prosecutor's Office's attributions come from the Constitution and cannot be transferred to any other Public or Private. According to article 127 of the Brazilian Constitution, "the Public Prosecution is a permanent institution, essential to the State's jurisdictional function. It must defend the juridical order, the democratic regime and the inalienable social and individual interests". This attribute means that as an independent body of justice, it is in charge of defending and protecting citizenship, the democratic regime and unavailable social and individual interests, enjoying legitimacy and procedural interest in defending fundamental rights, including the right of persons with disabilities.

Unavailable individual rights are strict to protect the person, so the holder cannot waive it. Thus, it is up to the State to ensure its whole exercise, guaranteeing the judicial means and through the Public Prosecutor's Office, which is also understood as a legal inspector in Brazil. There are two levels of Public Prosecutors, according to the federal or state level jurisdiction. The Federal Public Prosecutor's Office is subdivided into the Federal Public Prosecution Service; Prosecutor's Office of the Federal District and Territories; Public Prosecutor's Office, and Military Public Prosecutor's Office. At the state level, the Public Prosecutor's Office acts in the country's federal units and the state's municipalities, with the same duties as the Public Prosecutor's Office of the federal Union. They are governed by the complementary laws of the member states to which they belong, subject to the limits of the National Organizational Law of the Public Prosecution Service Act of 1993, n. 8625. At both levels - in the federal and State levels - the main job of public prosecutors in Brazil is to defend justice, democracy, unavailable social and individual interests, realise human rights and promote access to justice in a country with inequalities and social exclusions are barriers to citizenship. Its members start their careers by public exam, through tests of knowledge, academic titles and professional experience, reaching Prosecutor's position, when the member is appointed according to seniority and merit criteria.

This research showed that the body of defence and protection of citizenship, the Public Prosecutor's Office, does not comply with the legal requirements to allow disabled people access to their websites of requests, complaints and complaints. If the legal institution that should promote the defence and protection of the rights of persons with disabilities does not comply with accessibility requirements for their websites, this fact should be thoroughly investigated, which justifies and demonstrates this research's relevance.

5.2 The lack of accessibility as a limitation to the services provided by the public prosecutor's office by disabled people

In a first perspective, the lack of accessibility to these pages may seriously prevent disabled people from contacting the Public Prosecutor's Office to express the violations of their rights.

Many of the problems encountered on the manifestation pages of state-level and federal Public Prosecutor's Office can severely impact disabled people. Problems such as the lack of accessible 'CAPTCHAs' or inaccessible menu structures may make tasks not only difficult but impossible for many disabled users.

Making such pages more accessible to disabled people would be paramount to enable them to exert their civil rights and demand services from the Public Prosecutor's Office, be it related to digital accessibility issues or other issues they might encounter that are primarily handled via digital media. Other alternatives for filing complaints, such as in-person and paper-based forms do not provide the same possibilities for citizens, such as following the flux of their process step-by-step online.

5.3 The need to improve the technical capacity to perform technical inspections on investigations concerning Web accessibility

Aside from the difficulties that the accessibility problems encountered on the Public Prosecutor's Office can impose for disabled people, a more serious concern with the lack of accessibility on their websites is the lack of appropriate capacitation of their technical staff. Information Technology (IT) professionals employed by the Public Prosecutor's Office in different states and at the federal level in Brazil would be the first point of support to help perform accessibility inspections of websites being investigated after denunciation by disabled people.

The fact that their websites themselves present accessibility issues related to trivial aspects such as the ones related in this paper bring worrying concerns. This shows that it is of utmost importance that systematic programmes be implemented to implement technical capacitation to IT professionals working at different stances of the Public Prosecutor's Office. Such programmes can be done in partnership with universities across the country. They can also include technical bodies such as the W3C (as has been done in some states) and entities representing disabled people.

The Public Prosecutor's Office as a monitoring body may be found in a difficult position to demand the accessibility of public institutions while it does not guarantee full accessibility in their own websites. In this way, it is fundamental that the Public Prosecutor's Office promotes programmes regarding compliance with accessibility standards.

5.4 *Lack of denunciation of digital accessibility issues*

The authors also investigated the existence of manifestations related to government websites. Firstly, the authors surveyed the official electronic journal of the Public Prosecutor's Office of Minas Gerais. The research is referring to the first half of 2016. The authors verified the existence of 1,146 complaints involving people with disabilities. Of these, 164 procedures deal with complaints about accessibility problems, which are primarily about architectural, transportation and urbanistic barriers, respectively. The authors did not find any manifestation involving the issue of web accessibility.

When this article was written, only three processes had been found regarding Web accessibility at the federal level. The first one refers to the action filed in 2013 by a blind lawyer. The complaint addresses Resolution 185/13 of the National Council of Justice (CNJ), where the electronic judicial process system was instituted. Through this Resolution, it was determined that all petitions and other judicial proceedings be conducted electronically. However, the change from the physical process to the electronic process occurred without guaranteeing broad and unrestricted access to sites for people with disabilities (Brazil, 2014; Supremo Tribunal Federal, 2014; Conselho Nacional de Justiça, 2013). In response, the lawyer filed an administrative action with the National Justice Council to request compliance with Recommendation No. 27 / CNJ by the Electronic Judicial Portal and requested that the petitioner continue petitioning on paper until the accessibility standards were met.

However, the CNJ dismissed the preliminary injunction because the need for help from third parties to send an electronic petition does not present a danger of irreparable damage or difficult reparation, and the precautionary measure is not applicable. Minister Joaquim Barbosa handed down the decision. Dissatisfied with the decision, the lawyer filed a writ of mandamus No. 32,751 before the Federal Supreme Court (STF), with a request for a preliminary injunction, which Minister Lewandowski granted.

In 2013, the Federal Public Ministry filed a public civil action against the Federal University of Minas Gerais (UFMG) to compel the University to "adapt the facilities of all its buildings to the rules of architectural accessibility, urban planning, communication and information". Among the problems of accessibility found in the University, the Federal Public Prosecutor pointed out the lack of accessibility in the virtual moodle system, being required to adapt to the guidelines provided in the e-MAG. (Tribunal Regional Federal, 2018).

Regarding the portals of private institutions, the Federal Public Prosecutor's Office in São Paulo proposed in 2014 a public civil action, which was still pending, seeking to prohibit government advertising on sites that are not accessible. The Civil Inquiry was established under a representation submitted by the National Foundation for Education and Integration of the Deaf, reporting that the largest information sites in the country, such as Record, UOL, Estadão, Terra, Globo, Folha, SBT, IG, Band and Yahoo, are not accessible to people with hearing disabilities.

In May 2018, the authors sent the Ombudsman General of the Union a request for information on manifestations addressing accessibility problems in public digital services. The organ verified the existence of 2 manifestations compatible with the request. The demonstrations are about a problem with a CAPTCHA that does not have audio so that people with visual impairment have the proper access. However, both complaints were sent by members of the UFLA outreach project called 'Digital Accessibility', of which the authors are part.

This information reveals that people with disabilities still make complaints related to more fundamental issues of survival and fail to denounce issues that limit the exercise of citizenship more broadly.

According to the International Convention on the Rights of Persons with Disabilities, of which Brazil is a signatory, member states should promote to persons with disabilities the right to live independently and participate in social life. In this way, member states must ensure that persons with disabilities have equal access to information, communication, information systems, and technologies (United Nations, 2006).

5.5 Lack of specific accessibility technical regulation in Brazil outside of the Federal level

Even though only one stance was analysed at the federal level, results suggest that the Federal Public Prosecutor's Office was better equipped with accessibility resources at their website than their state-level counterparts.

The latest accessibility legislation in Brazil was updated in Law 13146 in 2015 (Brazil, 2015). The preceding law concerning the first aspects of digital accessibility in Brazilian legislation was Decree/Law 5296 in 2004 (Brazil, 2004). Decree/Law 5296 was followed by several acts that regulated technical aspects of Web accessibility for the Brazilian government at the federal level, such as eMAG, based on WCAG 2.0. Decree/Law 5296, however, was reticent in terms of web accessibility at state and municipal levels and for private institutions in Brazil.

Even though Law 13146 in 2015 brought in significant advances in terms of accessibility legislation in Brazil, bringing forward the need for accessibility for all public and private institutions present in the country still lacks detailed regulation to specify technical aspects that would support more effective law enforcement. The law limits to specify Websites should be following "best accessibility practices and guidelines adopted internationally". Even though the law seems to point to the adoption of technical standards such as WCAG 2.1, up to the time when this paper was written, no regulation had been put in place to allow more strict procedures to judicially frame public and private institutions that do not provide adequate accessibility support in their websites.

5.6 Law enforcement as a means of making web accessibility legislation more effective

For Lazar, Goldstein and Taylor (2015), governments have failed to enforce accessibility standards and policies. This failure is because laws are not self-executable, and enforcement tools are needed. The authors note that: "Digital technology, when accessible, can be a great opportunity to reduce discrimination and exclusion, to bring people together, instead of increasing barriers of discrimination" (Lazar, Goldstein & Taylor, 2015, 55). According to those authors, "the choice of a government to enforce or not enforce existing rules is a policy mechanism".

The State must take all necessary measures to promote the access of persons with disabilities to ICTs. People with disabilities should use these technologies in a free and independent way, enjoying every citizen's fundamental right. Thus, it is up to the Public Prosecutor's Office to conduct a self-criticism and implement the guidelines for accessibility on the Public Prosecutor's Office's websites, and later, collect from other public institutions.

Other authors, such as Huffaker (2015), have also pointed out the need for civil society and local and national governments and international bodies to implement more effective measures to make accessibility policies more effective.

Entities such as the Public Prosecutor's Office in Brazil and other similar agencies in other countries have a fundamental role in guaranteeing the rights of people with disabilities. In Brazil, in particular, the Public Prosecutor's Office has taken a central role in fighting corruption, with an essential display of the ability and effectiveness of the body's actions in the country's structure. Policies and partnerships must be built to enable the entity, in the federal and state stances, to expand their capacity to handle accessibility issues effectively as they have done in other areas with notable success.

6 Conclusions

This paper presented an analysis of the accessibility of manifestation pages in the federal public prosecutor's office's websites in Brazil and the 27 equivalent state stances. Although being responsible for safeguarding collective rights, such as accessibility, the results showed that the entities have failed to provide basic accessibility features on their websites.

The issues present on the websites included lack of alternatives to CAPTCHAs, inaccessible menu structures, inaccessible form fields, lack of appropriate heading structures, and other issues that can make the interaction more difficult or, sometimes, even impossible for some disabled people. Those issues are severe, as they prevent disabled citizens from having access to an essential service from the entities that oversee fundamental collective rights in Brazil. The results show that, like in many other countries, the public prosecutor's office's websites also have many accessibility problems.

From the results obtained, it is notable that there is a lack of technical capacity within the public prosecutor's office in different stances in Brazil. If the entity is not equipped with not well-trained technical IT staff, it may be seriously limited in its duties to investigate the lack of accessibility in governmental and private organisations.

The study's investigation also pointed out that there is a lack of formal complaints filed with the public prosecutor's office concerning web accessibility. Increasing the demand for complaints that need a response from the body would help make the matter more visible to society and Justice. Thus, it is up to associations of disabled people and other people involved with such issues to find ways to use the public prosecutor's office's services more frequently.

Most of the websites evaluated were related to state-level public prosecutor's offices. One possible explanation for the lack of adherence to web accessibility standards in these stances is the lack of specific regulation for state-level and local-level public services and private organisations. Current Brazilian legislation provides specific technical regulation only at the federal level.

Finally, this paper concludes by showing a need for more effective efforts to perform accessibility law enforcement and improve accessibility in different countries.

In future work, we intend to investigate further the behaviour of denouncing accessibility people amongst disabled people and the factors that influence disabled people to file or not complain regarding web accessibility. We also intend to continue with projects involving collaborations with different bodies in the Brazilian Justice

system to improve the capacity to defend disabled people's right concerning digital accessibility to governmental and private digital services.

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