Open access • Proceedings Article • DOI:10.1109/ICEDEG.2014.6819953

Egovernment and web accessibility in South America — Source link

Sergio Luján-Mora, Rosa Navarrete, Myriam Peñafiel

Institutions: University of Alicante, National Technical University

Published on: 24 Apr 2014 - International Conference on eDemocracy & eGovernment

Topics: Web Accessibility Initiative, Web accessibility, Web standards, Web page and Universal design

PREPRINT - Published in 2014 First International Conference on eDemocracy & eGovernment (ICEDEG):
https://ieeexplore.ieee.org/document/6819953
https://doi.org/10.1109/ICEDEG.2014.6819953

eGovernment and Web Accessibility in South America

Sergio Luján-Mora
Department of Software and Computing Systems
University of Alicante, Spain
sergio.lujan@ua.es

Rosa Navarrete
Faculty of System Engineering
National Polytechnic School, Ecuador
rosa.navarrete@epn.edu.ec

Myriam Peñafiel
Faculty of System Engineering
National Polytechnic School, Ecuador
myriam.penafiel@epn.edu.ec

***Abstract*— The number of e-government websites has increased greatly in recent years. Many countries have laws to ensure that e-government sites satisfy web accessibility requirements. The objective of web accessibility is to ensure that people with disabilities can access websites just like everyone else. However, laws that enforce web accessibility do not automatically guarantee compliance: e-government websites are not always prepared to provide a correct service to persons with disabilities. This paper analyses the accessibility of a group of e-government websites of all South American countries and Spain. Three official websites from each country has been analysed: the government, the Parliament and the Senate websites. Different automatic evaluation tools have been used to perform the analysis. The preliminary results of our research show that the majority of e-government websites do not provide adequate levels of web accessibility.**

Keywords*— *e-government; e-participation; e-inclusion; web accessibility; universal access

I. INTRODUCTION

Currently, the World Wide Web (the Web) is present in all areas of our lives, from accessing the Web to collect information about different topics to using online services as the electronic government (e-government). In a very short period of time compared to the history of human beings, the Web has become an essential part of our society and lives.

The number of e-government websites has increased greatly in recent years because both national and local authorities are realizing the benefits that online government services may provide. According to Freeman & Loo [1], there are three categories of benefits that governments can achieve by developing websites for e-government: efficiency, user convenience and citizen involvement. The citizen involvement implies the participation of all the members of the society. Nevertheless, some members, such as persons with disabilities, can have difficulties to get involved.

The number of persons with disabilities accessing e-government is growing, but e-government websites are not always prepared to provide a correct service to persons with disabilities. Many web users may encounter problems if e-government websites do not achieve a minimum level of web accessibility. Web accessibility usually refers to creating websites accessible to all users who want to access them, regardless of users' disability. When websites are correctly designed and developed, all users can have access to their information and functionality. A simple definition of web accessibility is *"the property of a site to support the same level of effectiveness for people with disabilities as it does for non-disabled people"* [2]. An alternative definition of accessibility is *"making web content available to all individuals, regardless of any disabilities or environmental constraints they experience"* [3]. In summary, the objective of the web accessibility is to ensure that people with disabilities can access websites just like everyone else.

Some authors have examined the factors that most prevent the adoption of e-government applications by citizens [4]. Some studies [5] highlighted that an obstacle to effective e-government services was making those sites available to persons with physical disabilities. Therefore, web accessibility can be critical to promote e-government services among all citizens. Providing equal access to people with different disabilities (visual, hearing, cognitive, mental, and physical impairments) represents a huge challenge for web designers and web developers. Unfortunately, the lack of web accessibility can convert e-government website into a new source of digital divide [6].

Many countries have laws to ensure that e-government sites satisfy web accessibility requirements. However, laws that enforce web accessibility do not automatically guarantee compliance. Therefore, it is needed to check the level of compliance of web accessibility of e-government websites to have a current diagnosis of the situation.

Some studies have been done to analyse the accessibility of particular countries [7, 8, 9]. Other studies have analysed and compared different groups of countries [10, 11]. However, as far as we know, there is not any study that measures the level of compliance with accessibility guidelines among South American countries. In order to eliminate this gap, the research presented in this paper examines the accessibility of e-government web sites for South American countries.

In previous studies [12, 13], we have proposed a combined methodology to evaluate the accessibility of websites. In this paper, the result of a comparative study of the web

accessibility of official websites from South American countries is presented. Besides, Spain has also been included in the comparison. The aim of this study is to provide evidence and analysis to help understand and compare the level of compliance of accessibility guidelines by South American countries. For each country, three official websites from each country has been analysed: the government, the Parliament and the Senate websites.

II. Web Accessibility and Evaluation Tools

Web accessibility primarily benefits people with disabilities. However, as an accessible website is designed to meet different user needs, preferences, skills and situations, this flexibility can also benefit people without disabilities in certain situations, *"such as people using a slow Internet connection, people with temporary disabilities such as a broken arm, and people with changing abilities due to aging"* [14]. In addition, an accessible website can help people who have limited access to certain technology, such as old computers or slow Internet connections.

In 1999, the Web Accessibility Initiative (WAI), a project by the World Wide Web Consortium (W3C) published the Web Content Accessibility Guidelines (WCAG) version 1.0 [15]. These guidelines were widely accepted in many countries around the world as the definitive guidelines on creating accessible websites. However, on 11 December 2008, the WAI released the WCAG version 2.0 [16] to be up to date while being more technology neutral. In both versions, conformance to the WCAG is based on four ordinal levels of conformance (none, A –the lowest–, AA, and AAA –the highest–). Level A includes checkpoints that are essential: in other words, if these checkpoints are not met, then even assistive technology cannot make content accessible. Therefore, a web content developer must always satisfy these checkpoints. Level AA includes checkpoints that remove significant barriers to accessing web documents: if these checkpoints are not satisfied, one or more groups of users will find it difficult to access web documents. Finally, level AAA includes checkpoints that are not essential: satisfying these checkpoints will improve access to web documents.

Most countries have been using the WCAG 1.0 guidelines as reference to enforce their compliance with the principles of web accessibility. In most cases, level AA was selected as the minimum level required to guarantee web accessibility. However, WCAG 2.0 was approved as an ISO/IEC 40500 International accessibility standard in October 2012 [17]. This means that more countries can formally adopt WCAG 2.0 and many countries are updating their laws to the new version.

Verifying the accessibility of a website can be a time consuming task and requires expert evaluators to validate the results. Automatic evaluation tools such as AChecker, A-Prompt, Cynthia Says, EvalAccess 2.0, eXaminator, TAW 1.0 and 2.0, Total Validator, and WAVE 4.0 have been the pioneers and are the most well-known, due to their usability, ease of use and its quick results.

Automatic tools generally verify the presence of a valid element or attribute, such as the alt attribute (alternative text) or the label element (description of a form control). However, human judgment is also needed, because some questions are very relevant, such as whether or not the value of the alt attribute clearly and effectively conveys the function of the image. For example, there is a big difference between the alternative text that an active or inactive image needs. Indeed, in some cases an image may not need an alternative text (null alt text).

A recent study [18] tested and compared the capabilities of six automatic current web accessibility evaluation tools, by analysing their coverage, completeness and correctness with regard to WCAG 2.0 conformance. The conclusion was that relying on only one automatic evaluation tool was an error because none of the analysed tools obtained the best scores in all the dimensions studied. For example, some tools exhibited high completeness scores and low correctness scores at the same time. Therefore, a web accessibility analysis based only on automatic evaluation tools should include the results of different tools in order to achieve reliable results.

III. Web Accessibility Legislation in South America

Several countries around the world have introduced legislation about the persons with disabilities and their rights. Regarding web accessibility, some legislation directly addresses the need for accessible websites, whereas other legislation addresses the more general requirement for people with disabilities not to be discriminated against.

In South America, some countries still do not have any law regarding web accessibility. Other South American countries have some kind of recommendations that mention accessibility, but nothing mandatory. As far as we know [19], the following South American countries have laws that enforce web accessibility:

- Argentina: Law 26,653 of accessibility of information on web pages (2010).
- Brazil: Decree 5,296, of general rules and basic for the promotion of accessibility to disabled persons or persons with reduced mobility (2004).
- Chile: Supreme Decree 100, technical standard for developing web sites of public administration (2006).
- Colombia: Law 1,680, which guarantees the access to information by blind and low vision people (2013).
- Peru: Ministerial Resolution 126-2009-PCM, approves guidelines for accessibility of web pages and applications for mobile phones for public institutions of the National System of Information (2009).
- Venezuela: Resolution 026, accessibility guidelines (2011).

Other countries, such as Ecuador, are working on developing their own laws and standards. For example, Ecuador recently published their web accessibility standard based on ISO/IEC 40500:2012 [20], but they still do not have a law that says how the standard should be applied.

IV. METHOD OF ANALYSIS

In this study, the 12 South American countries have been analysed and compared: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Surinam, Uruguay and Venezuela. The two dependent territories, French Guiana and Falkland Islands have not been analysed because they do not have their own government websites. Besides, Spain has also been included in the analysis in order to compare the results with a country outside South America. The reason to include Spain in this analysis is twofold: on the one hand, Spain has had laws enforcing web accessibility for more than 12 years; on the other hand, Spain belongs to the group of "developed countries", whereas the other countries belong to the group of "developing countries". Therefore, Spain can be used as a reference or baseline in our analysis.

Three official websites from each country has been analysed: the official website of the government; the official website of the Parliament (lower house); the official website of the Senate (upper house). The main criterion to decide the government websites to be compared was to use the most representative websites of each country.

There are a number of differences between the national parliaments of the South American countries, owing to the various historical developments of each country and recent reforms. Therefore, all the analysed countries have a bicameral system, except Ecuador, Guyana, Peru, Surinam, Uruguay and Venezuela. Table I shows the whole list of the websites analysed in this research.

The home page of each one of the websites has been analysed from three points of view: HTML and CSS validity; web accessibility; and, current use of HTML5 and ARIA.

The home page of a website is the first contact a user has with the website. If the home page shows problems or is not accessible, it would be very difficult that a disabled user can access other pages of the website. Therefore, it is essential to ensure the accessibility of the home page of a website.

All the tests of a web page were conducted during the same day in order to avoid changes in its content.

A. HTML and CSS Validity

Two automatic evaluation tools have been used to evaluate the validity of the HTML and CSS of the websites. The first tool is the Markup Validation Service, a free service by the W3C [21]. This tool checks the markup validity of web documents in HTML, XHTML, SMIL, MathML, etc. According to the W3C [22], "*Validating web documents is an important step which can dramatically help improving and ensuring their quality, and it can save a lot of time and money"*. The result of the Markup Validation Service is summarized in the number of errors and warnings in a web page. The second tool is the CSS Validator Service, another free service by the W3C [23]. This tool compares the style sheets of a web page to the CSS specifications. It can find errors, typos, or incorrect uses of CSS; it can also detect when CSS poses some risks in terms of usability.

B. Web Accessibility

Five automatic evaluation tools have been used to evaluate the accessibility of the websites analysed in this study: AChecker, eXaminator, TAW, Total Validator and WAVE.

TABLE I. E-GOVERNMENT WEBSITES ANALYSED

Argentina	
Government	http://www.casarosada.gob.ar/
Parliament	http://www.diputados.gov.ar/
Senate	http://www.senado.gov.ar/
Bolivia	
Government	http://www.presidencia.gob.bo/
Parliament	http://www.diputados.bo/
Senate	http://www.senado.bo/
Brazil	
Government	http://www2.planalto.gov.br/
Parliament	http://www2.camara.leg.br/
Senate	http://www.senado.gov.br/
Chile	
Government	http://www.gob.cl/
Parliament	http://www.camara.cl
Senate	http://www.senado.cl/
Colombia	
Government	http://wsp.presidencia.gov.co/
Parliament	http://www.camara.gov.co/
Senate	http://www.senado.gov.co/
Ecuador	
Government	http://www.presidencia.gob.ec/
Parliament	http://www.asambleanacional.gov.ec/
Guyana	
Government	http://www.op.gov.gy/
Parliament	http://www.parliament.gov.gy/
Paraguay	
Government	http://www.presidencia.gov.py/
Parliament	http://www.diputados.gov.py/
Senate	http://www.senado.gov.py/
Peru	
Government	http://www.presidencia.gob.pe/
Parliament	http://www.congreso.gob.pe/
Spain	
Government	http://www.lamoncloa.gob.es/
Parliament	http://www.congreso.es/
Senate	http://www.senado.es/
Surinam	
Government	http://www.president.gov.sr/
Parliament	http://www.dna.sr/
Uruguay	
Government	http://www.presidencia.gub.uy/
Parliament	http://www.parlamento.gub.uy/
Venezuela	
Government	http://www.presidencia.gob.ve/
Parliament	http://www.asambleanacional.gob.ve/

AChecker [24] is an online free service that produces a report of accessibility problems according to different guidelines (Section 508, WCAG 1.0, WCAG 2.0). AChecker classifies accessibility problems into three categories: known problems (problems that have been identified with certainty as

accessibility barriers), likely problems (problems that have been identified as probable barriers, but require a human to make a decision) and potential problems (problems that AChecker cannot identify, that require a human decision). AChecker also provides an Application Programming Interface (API) that allows remote accessibility analysis.

eXaminator is an online free service to check the accessibility of a web page developed by Carlos Benavídez [25]. eXaminator checks the application of the WCAG 2.0 [16] on the HTML and CSS contents in a web page and summarizes the results in an overall score from 1 to 10 that is quite easy to understand by everybody. Of course, the score calculated by eXaminator is a fast check of accessibility, but automatic evaluation does not cover all of the success criteria in WCAG 2.0.

TAW is a limited online free service to check the web accessibility against WCAG 1.0 and 2.0 [26]. TAW classifies accessibility problems into automatic problems, those in which the tool is certain that the problem violates the guidelines and manual problems, those that need to be reviewed by an expert.

Total Validator is an HTML validator, an accessibility validator, a spell checker, and a broken links checker, all included into one tool [27]. This tool is provided in two versions: the basic tool for free and the professional tool that must be purchased.

Finally, WAVE is an online automatic evaluation tool that helps web developers to make their web content more accessible [28]. However, WAVE cannot completely state if a web page is accessible, only a human can determine true accessibility. WAVE detects HTML5 and Accessible Rich Internet Applications (ARIA) features, such as <header>, <footer>, ARIA landmarks and roles, and so on. Besides, WAVE also provides an API that allows automated and remote accessibility analysis of web pages using the WAVE processing engine.

C. Current Use of HTML5 and ARIA

The use of HTML5 is an example of modern technology in the development of a website. Although the first draft of HTML5, the latest version of HTML, was published by the W3C in January 2008 [29], six years later the use of the new version of the markup language of the Web is not very common yet. According to the W3C's plan, HTML5 is expected to be completed and published at the end of 2014.

HTML5 addresses some areas that had not been adequately defined in previous versions. Besides, HTML5 updates the specification to include latest advances and best practices in web development that have appeared in the past few years. HTML5 also includes new accessibility features that will improve the accessibility of websites.

On the other hand, ARIA, another standard of the W3C, addresses the lack of accessibility of many web pages. With ARIA, developers can make advanced websites and web applications accessible and usable to people with disabilities. Unfortunately, many web developers do not know the existence and the purpose of ARIA.

Nowadays, the combined use of HTML5 and ARIA defines a new way to make web content and web applications more accessible to people with disabilities. Therefore, the use of these technologies is critical.

D. Limitations

Web accessibility testing studies how websites with accessibility barriers affect the way users with disabilities use the Web. Web accessibility evaluation tools and expert inspections cannot substitute user testing, because the difficulties of understanding all the interactions between web content and assistive technology.

V. RESULTS

A. HTML and CSS Validity

Table II shows the HTML and CSS validity results. A colour code is used to clarify the results. Errors represent the number of validation errors: the lower the value, the better the validation. A dark green colour represents a better level of validation (lower number of errors), whereas a dark red colour represents a worse level of validation (higher number of errors). The pure red colour without numbers indicates an anomalous situation detected during the analysis: two websites could not be analysed, the website of the Parliament of Guyana and the website of the Parliament of Venezuela.

Only the website of the Government of Guyana had 0 validation errors. According to the metadata tags that appear in the HTML code of Guyana's Government website, the web page is created by the Content Management System Joomla! 1.5. The following websites with the less number of HTML errors were: the Government of Spain with 1 error, the Parliament of Chile with 4 errors, and the Parliament of Brazil and the Senate of Brazil, both with 5 errors.

The worst results were obtained with the website of the Senate of Argentina, with 889 errors, and the Parliament of Argentina, with 350 errors.

Regarding the CSS validation, the best results were the website of the Government of Spain and the website of the Parliament of Uruguay with 0 errors. On the opposite side, the Government of Paraguay presented the highest number of errors with 641.

B. Web Accessibility

Due to the lack of space, we cannot include the whole results of the web accessibility analysis. Therefore, Table III summarizes the number of problems detected with automatic evaluation tools and some information has to be discarded. This table follows the same colour schema as Table II: a dark green colour represents a better level of accessibility (lower number of barriers), whereas a dark red colour represents a worse level of accessibility (higher number of barriers). Unfortunately, the home pages of all the websites have accessibility issues.

In Table III, column "AChecker" represents the number of "known problems" that have been detected. According to

AChecker, these problems should be fixed. “Likely” and “potential errors” have not been included in the table.

Column “eXaminator” shows the global score provided by this tool, a value from 1 to 10: the higher the value, the better the accessibility of the web page.

TABLE II. HTML AND CSS VALIDATION RESULTS

Country	Website	HTML Errors	HTML Warns	CSS Errors	CSS Warns
Argentina	Government	49	12	32	43
Argentina	Parliament	350	368	19	18
Argentina	Senate	889	16	40	43
Bolivia	Government	21	30	2	5
Bolivia	Parliament	44	52	9	27
Bolivia	Senate	17		7	13
Brazil	Government	147	1	26	36
Brazil	Parliament	5	1	26	36
Brazil	Senate	5	1	26	36
Chile	Government	22	6	22	10
Chile	Parliament	4		18	11
Chile	Senate	57	7	4	54
Colombia	Government	20	2	35	454
Colombia	Parliament	279	118	27	5
Colombia	Senate	162	26	8	29
Ecuador	Government	41	10	27	108
Ecuador	Parliament	225	32	19	10
Guyana	Government	0	0	3	40
Guyana	Parliament				
Paraguay	Government	47	8	641	363
Paraguay	Parliament	166	96	12	0
Paraguay	Senate	175	69	67	0
Peru	Government	33	93	18	38
Peru	Parliament	105	25	2	140
Spain	Government	1	0	0	46
Spain	Parliament	196	53	3	0
Spain	Senate	39	3	2	7
Surinam	Government	30	36	25	21
Surinam	Parliament	6	2	11	27
Uruguay	Government	38	22	1	14
Uruguay	Parliament	36	3	0	0
Venezuela	Government	242	169	34	80
Venezuela	Parliament			23	56

Column “TAW 1.0 P1” indicates the number of issues to pass the WCAG 1.0 priority 1 (A level) requirement that can be automatically detected. The manual errors have been discarded because they required additional human intervention. Column “TAW 2.0 Problems” provides the number of problems that should be corrected because there is a certainty about them. “Warnings” and “Not verified problems” have also been discarded and they are not showed in the table. Column “TV Errors WCAG 2.0 A” shows the number of errors of WCAG 2.0 priority 1 (A level) detected by Total Validator. The other errors have been discarded. Finally, column “WAVE Errors” provides the number of errors detected by WAVE. “Alerts” have also been discarded.

In general, the worst results regarding web accessibility were obtained with the websites of the Parliament of Argentina and the Parliament of Venezuela. On the other side, the best results were obtained with the websites of the Parliament of Brazil and the Government of Guyana.

C. *Current Use of HTML5 and ARIA*

The DOCTYPE is a declaration that always has to appear at the very top of HTML documents. This declaration defines the type of document, tells the browser what element to expect as the top-level element, and identifies the version of the type of document. According to the results of W3C’s Markup Validation Service [21], only 6 web pages (18%) have the HTML5 DOCTYPE: the Government and Senate of Chile, the Government of Colombia, the Government of Ecuador, the Government of Paraguay and the Parliament of Surinam.

TABLE III. ACCESSIBILITY RESULTS

Country	Website	AChecker	eXaminator	TAW 1.0 P1	TAW 2.0 Problems	TV Errors WCAG 2.0 A	WAVE Errors
Argentina	Government	10	6,6	12	166	16	15
Argentina	Parliament	366	4,1	65	891	250	32
Argentina	Senate	97	4	80	373	96	16
Bolivia	Government	23	3,4	6	56	17	11
Bolivia	Parliament	38	5,7	1	105	46	28
Bolivia	Senate	30	4	11	96	819	14
Brazil	Government	39	5,2	3	118	130	32
Brazil	Parliament	6	8	10	13	11	0
Brazil	Senate	29	5,2	3	118	130	32
Chile	Government	44	5,1	4	44	23	9
Chile	Parliament	12	5,1	7	41	21	10
Chile	Senate	17	6,4	0	61	17	12
Colombia	Government	208	5,1	3	51	1	1
Colombia	Parliament	48	3,8	3	228	45	14
Colombia	Senate	22	4,6	8	192	44	14
Ecuador	Government	62	4,3	1	141	65	38
Ecuador	Parliament	96	3,6	20	126	77	23
Guyana	Government	2	6,8	0	9	9	1
Guyana	Parliament						
Paraguay	Government	126	4,9	11	58	25	14
Paraguay	Parliament	270	2,6	21	142	48	42
Paraguay	Senate	116	2,7	25	69	64	27
Peru	Government	71	4,7	6	67	43	9
Peru	Parliament	0	2,4	59	92	59	29
Spain	Government	30	6,3	1	55	38	5
Spain	Parliament		5	3	63	69	23
Spain	Senate	9	5,8	6	3	16	0
Surinam	Government	10	4,9	4	39	11	5
Surinam	Parliament	0	6	0	46	5	2
Uruguay	Government	128	7,2	0	6	6	1
Uruguay	Parliament	10	3,7	7	15	8	1
Venezuela	Government	10	4,1	24	218	107	
Venezuela	Parliament	979	2,8	106	364	339	106

Regarding the use of ARIA, WAVE [28] has been used to detect ARIA features in the analysed websites. Only 6 web sites (again 18%) present some use of ARIA: the Senate of Argentina, the Parliament of Brazil, the Government and the Senate of Chile, the Government of Colombia, and the Government of Ecuador. For example, this last website makes use of: one header (<header>), one footer (<footer>), three navigation sections (<nav>) and four ARIA landmarks (*complementary*, *contentinfo*, *banner*, and *navigation*).

VI. DISCUSSION AND FUTURE WORK

An accessible website is one which can be used by all its intended visitors, taking into account their differing

capabilities. Due to the importance the Web has in all areas of our lives, making websites accessible for all people with disabilities is critical. The Web provides huge opportunities to overcome barriers (socio-economic, geographic, cultural, time, etc.) for people with disabilities.

In this paper, we examine the levels of web accessibility of e-government websites in South America. This research has some important limitations. Automatic evaluation tools provide quick results that are essential when the analysis of a large number of pages is needed. In this study, only the home page of each website has been analysed. In order to achieve a more accurate view of the accessibility of each website, this study is going to be extended to study hundreds or thousands of web pages in each website to have a more precise view of the accessibility. On the other hand, web accessibility evaluation tools can be effective to check level of conformance with accessibility tests, but clearly cannot replace the experienced evaluators' judgment. In our study it is difficult to obtain conclusive results because each automatic evaluation tool detects different types of errors. Because of this, it is difficult to say which one of the analysed websites presents the best and the worst level of web accessibility. However, in view of the results, it is clear that the vast majority of South American government websites do not meet minimum levels of web accessibility requirements. In order to obtain more conclusive results, we plan to compare the results across countries and across different government websites. Some countries (Argentina, Brazil, Chile, Colombia, Peru and Venezuela) have their own web accessibility laws which mandate sites meet minimum accessibility requirements. However, even those countries have not totally met minimum requirements. This result shows that governments need to not only implement laws, but they must implement policies to encourage e-government inclusion in their developments in order to meet the needs of persons with disabilities. One way to get a more realistic view of the accessibility of a website is to analyse the most relevant pages according to the results of a search engine. Therefore, we plan to base our future analysis on the most relevant, and therefore, most important web pages of a website. Finally, another future work we plan to address is to detect the most common problems that recur in the same site and between different sites.

ACKNOWLEDGMENTS

This work has been partially supported by the Prometeo Project by SENESCYT, Ecuadorian Government.

REFERENCES

[1] R.J. Freeman and P. Loo, "Web 2.0 and E-Government at the Municipal Level," Proceedings of the 2009 World Congress on Privacy, Security, Trust and the Management of e-Business, pp.70-78, 2009.

[2] J. Slatin and S. Rush, "Maximum Accessibility: Making Your Web Site More Usable for Everyone", Addison-Wesley, 2003.

[3] J. Mankoff, H. Fait, and T. Tran, "Is Your Web Page Accessible? A Comparative Study of Methods for Assessing Web Page Accessibility for the Blind," Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'05), pp. 41-50, 2005.

[4] R.W. Schwester, "Examining the Barriers to e-Government Adoption," Electronic Journal of e-Government, vol. 7, issue 1, pp. 113-122, 2009.

[5] R. Eynon and W.H. Dutton, "Barriers to Networked Governments: Evidence from Europe," Prometheus: Critical Studies in Innovation, vol. 25, issue 3, pp. 225-242, 2007.

[6] J. Sipior and B. Ward, "Bridging the Digital Divide for e-Government inclusion: A United States Case Study," The Electronic Journal of e-Government, vol. 3, issue 3, pp 137-146, 2005.

[7] M. Al-Radaideh, M. Nuser, and A. Wahbeh, "Evaluating Accessibility of Jordanian E-Government Websites for People with Disabilities," Proceedings of International Conference on Information & Communication Systems, pp. 127-131, May 2011.

[8] A. Abanumy, A. Al-Badi, and P. Mayhew, "e-Government Website Accessibility: In-Depth Evaluation of Saudi Arabia and Oman", The Electronic Journal of e-Government, vol. 3, issue 3, pp. 99-106, 2005.

[9] B. Al Mourad and F. Kamoun, "Accessibility Evaluation of Dubai e-Government Websites: Findings and Implications," Journal of E-Government Studies and Best Practices, vol. 2013, article ID 978647, pp. 1-15, 2013.

[10] M. Goodwin, D. Susar, A. Nietzio, M. Snaprud, and C. S. Jensen, "Global Web Accessibility Analysis of National Government Portals and Ministry Web Sites", Journal of Information Technology & Politics, vol. 8, issue 1, 41-67, 2011.

[11] J. Kuzma, D. Yen, and K. Oestreicher, "Global e-government Web Accessibility: An Empirical Examination of EU, Asian and African Sites," Second International Conference on Information and Communication Technologies and Accessibility, pp. 1-6, 2009.

[12] F. Masri and S. Luján-Mora, "A Combined Agile Methodology for the Evaluation of Web Accessibility," IADIS International Conference Interfaces and Human Computer Interaction (IHCI 2011), pp. 423-428, 2011.

[13] S. Luján-Mora and F. Masri, "Evaluation of Web Accessibility: A Combined Method", in Pedro Isaias, Miguel Baptista Nunes (Eds.), Information Systems Research and Exploring Social Artifacts: Approaches and Methodologies, Information Science Reference, pp. 314-331, 2012.

[14] World Wide Web Consortium (W3C), "Introduction to Web Accessibility", 2005. Internet: http://www.w3.org/WAI/intro/accessibility.php

[15] World Wide Web Consortium (W3C), "Web Content Accessibility Guidelines 1.0", 1999. Internet: http://www.w3.org/TR/WCAG10/

[16] World Wide Web Consortium (W3C), "Web Content Accessibility Guidelines (WCAG) 2.0", 2008. Internet: http://www.w3.org/TR/WCAG/

[17] International Standard Organization, "ISO/IEC 40500:2012 Information technology -- W3C Web Content Accessibility Guidelines (WCAG) 2.0", 2012.

[18] M. Vigo, J. Brown, and V. Conway, "Benchmarking web accessibility evaluation tools: measuring the harm of sole reliance on automated tests," Proceedings of the 10th International Cross-Disciplinary Conference on Web Accessibility (W4A '13), pp. 1-10, 2013.

[19] S. Luján-Mora, "Legislación en Iberoamérica," Accesibilidad Web, 2014. Internet: http://accesibilidadweb.dlsi.ua.es/?menu=iberoamerica

[20] Instituto Ecuatoriano de Normalización, "NTE INEM-ISO/IEC 40500 'Tecnología de la información - Directrices de accesibilidad para el contenido web del W3C (WCAG) 2.0 (ISO/IEC 40500:2012, IDT)'", Registro Oficial nº 171, January 28 2014.

[21] World Wide Web Consortium (W3C), "The W3C Markup Validation Service". Internet: http://validator.w3.org/

[22] World Wide Web Consortium (W3C), "About The W3C Markup Validation Service". Internet: http://validator.w3.org/about.html

[23] World Wide Web Consortium (W3C), "The CSS Validation Service". Internet: http://jigsaw.w3.org/css-validator/

[24] Inclusive Design Institute, "AChecker". Internet: http://achecker.ca/

[25] C. Benavídez, "eXaminator". Internet: http://examinator.ws/

[26] Fundación CTIC, "TAW". Internet: http://www.tawdis.net/

[27] Total Validator, "Total Validator". Internet: http://www.totalvalidator.com/

[28] WebAIM, "WAVE". Internet: http://wave.webaim.org/

[29] World Wide Web Consortium (W3C), “HTML 5 - A vocabulary and associated APIs for HTML and XHTML - W3C Working Draft”, 22 January 2008. Internet: http://www.w3.org/TR/2008/WD-html5-20080122/