

CHAPTER 5

E-GOVERNANCE WEBSITE ACCESSIBILITY EVALUATION BY AUTOMATIC TOOL'S PERSPECTIVE

5.1 Introduction

The literature review chapter provided general and useful information about the usual status of E-Governance development, E-Governance websites accessibility in India, website users and about web accessibility concepts.

However, in order to expand on the existing studies and before starting into the indepth investigation of the managers, content developers and end-user's views, this chapter was started by the views of E-Governance websites accessibility evaluation by tool's perspective in India. This method achieves the primary goal of the study which is to investigate the level of accessibility of existing E-Governance websites in India from the automatic evaluation tool's perspective.

The level of accessibility of the existing E-Governance websites in India was investigated by automatic web accessibility evaluation tools so as to verify the W3C guidelines on E-Governance websites, i.e. the WCAG 1.0 and WCAG 2.0 for developing accessible websites for disabled people. The tool study was addressed in order to gain an understanding of the existing accessibility guidelines and to check if they are properly implemented on E-Governance websites in India.

This chapter is organized as follows; this chapter started with the introduction, then the goals for the automated tool testing method, followed by the methodology adopted in this study and further details the study outcomes. Furthermore it extends to give brief discussion about the study outcomes and ends with the summary and conclusion.

5.2 Goals of Automated Testing

Automated testing of the accessibility of websites through the use of special software can have several benefits. Perhaps most importantly, automated testing can target the coding of a site, providing insight into how extensively the accessibility issues were considered in the design of the particular site.

The free testing tools offer a quick and inexpensive means to begin accessibility testing, particularly since some automated products can be set to evaluate sites in terms of a specific set of guidelines, such as WCAG 1.0, WCAG 2.0, Stanca act, Section 508, CSS. Further, if the comprehensive versions that are available for automated testing programs are purchased and installed, the software can help to guide developers in making a site accessible as they are creating or modifying it.

Studies involving free automated testing tools are also generally the only test for homepages of sites. There are two reasons for this tendency.

First, it makes some sense that a homepage would be one of the more accessible, if not the most accessible, parts of a site. A homepage serves as the gateway through which an entire site is accessed; without an accessible homepage, most users with disabilities would be unable to reach other parts of the website. Homepages tend to be the best designed and maintained pages on a site, and are generally managed by the primary office of an agency, whereas sub-pages may be overseen by different departments within an organization (Lazar et al. 2003; Sharma et al. 2008). Many previous studies that have employed automated software tools have found that the results produced from testing the homepage with automated software is generally representative of the results produced by testing other pages on a site (Ellison 2004; Federici et al. 2005).

There is, however, a second reason that previous studies have focused on homepages to websites when using automated testing tools. The free automated testing tools primarily are designed to test one page at a time. Researchers likely have found it easier to test the homepages as representative rather than testing each individual page of a website.

5.3 Methodology

We have considered four different categories of E-Governance websites for evaluating their accessibility level for the easy use and access of disabled people. Under each category we have selected eight to eleven websites which are frequently used by the public, thus a total of 40 websites are used in our study. Next, the facilities provided by each of the websites are minutely checked in terms of the accessibility guidelines WCAG 1.0 and WCAG 2.0. The accessibility parameters (WCAG 1.0 and WCAG 2.0) are checked using automatic evaluation tools. Figure 5.1 shows the methodology flow for automatic tool evaluation on E-Governance websites.

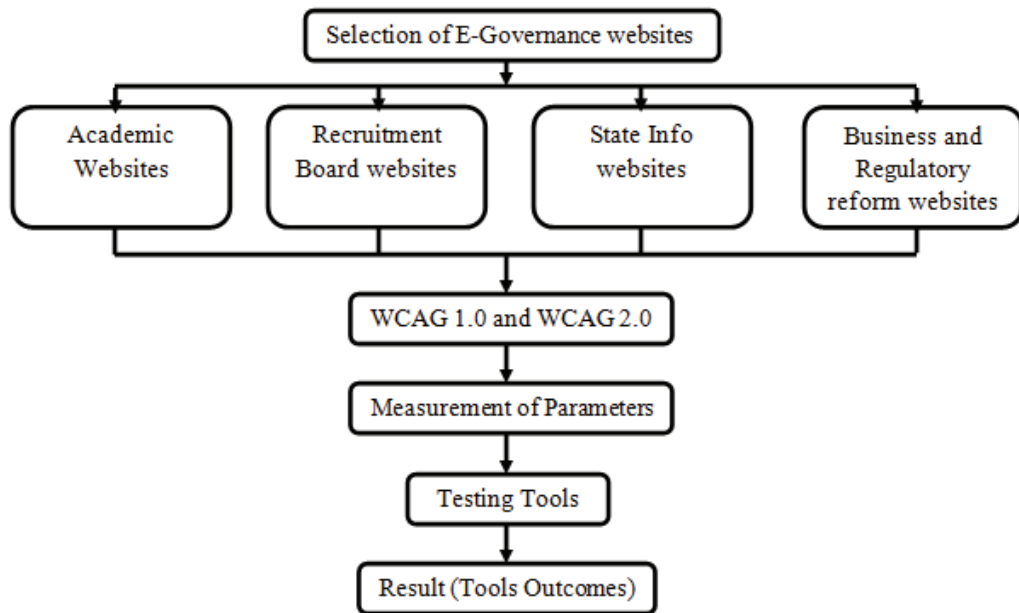


Figure 5.1 Methodology Flow for Tool Evaluation

5.3.1 Tool selection

The first phase of the study was to choose an appropriate software tool to analyze the site based on WCAG accessibility guidelines. In chapter 3, section 3.3.4.3 we have discussed about the automatic tools to check the accessibility level of websites. Further discussed the best tool to check accessibility level based on the report of Mifsud (2011).

According to Justin Mifsud (2011), the AChecker is the best tool to analyze about the accessibility of websites. ATRC University of Toronto, has developed a software product, A-Checker, to analyze accessibility problems with Web pages. A-Checker is based on WCAG 2.0, WCAG 1.0, Section 508, Stanca Act, BITV guidelines and can test checkpoint levels A, AA and AAA (Fundacion CTIC 2009). For each of these checkpoints A-Checker provides a detailed report of both automatic and human review problems. Automatic issues are those errors that the software has checked based on the WCAG 2.0 & WCAG 1.0 guidelines. Problems that are tagged as requiring human review are warnings that are not always accurately measured by an automated tool and should be manually checked by the Web designer. When errors or warnings are tagged, the researcher can click on the specific error tag and a detailed explanation based on the WCAG guidelines will be explained.

There is one limitation in the software tool is that it can only analyze one page at a time, and cannot review the whole site. According to Ellison (2004), Lazar et al. (2003), Federici et al. (2005); the consistent method of testing a website is its home page. However, for the research of this study, we have checked with Home pages of each E-Governance websites. Figure 5.2 shows the home screen of the AChecker tool.

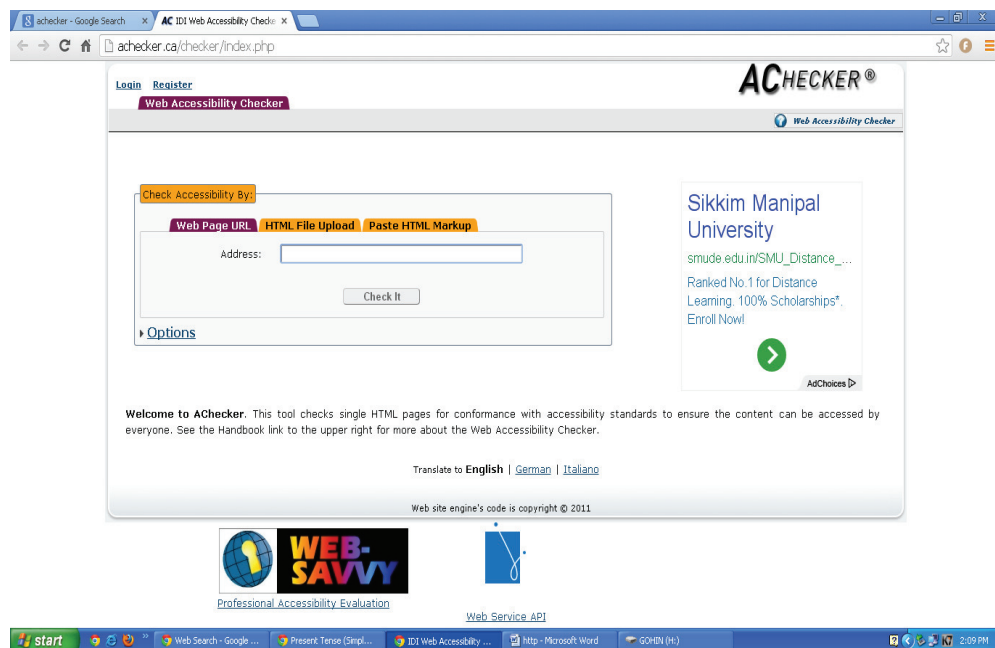


Figure 5.2 Home Screen of AChecker tool (achecker.ca 2012)

5.3.2 Description of Sample Web Sites Used For Analysis

According to Chander & Kush (2011) most of the Indian government departments have individual websites that offer information and services directly to citizens, including information for research, government forms and services, public policy information, employment and business opportunities, voting information, tax filing, license registration or renewal, payment of fines, and submission of comments to government officials.

Hence, we have selected four major categories (University's websites, state information websites, business and regulatory reform websites and recruitment board websites) of 40 E-Governance websites by google search engine for this part of study. Table 5.1 shows that the category wise E-Governance websites. The data taken for our analysis is gathered during the period of 7th September 2012 to 23rd October 2012.

Table 5.1 Category wise E-Governance websites

s.no	Universities	State Information	Business Enterprise and Regulatory Reform	Recruitment Board
1.	www.nagarjunauniversity.ac.in	www.tn.gov.in	www.bsnl.co.in	http://www.rrbald.gov.in/
2.	www.iitm.ac.in	www.delhigovt.nic.in	www.sr.indianrailways.gov.in	http://www.upsc.gov.in
3.	www.south.du.ac.in	www.gujaratindia.com	http://www.incometaxindia.gov.in	http://trb.tn.nic.in
4.	www.annauniv.edu	www.maharashtra.gov.in	http://tnvelaivaaiippu.gov.in	www.tnpsc.gov.in
5.	www.unom.ac.in	www.kerala.gov.in	http://www.tneb.in	http://banks-india.com
6.	www.andhrauniversity.info	www.planning.rajasthan.gov.in	http://waterresources.rajasthan.gov.in	http://www.mrb.tn.gov.in/
7.	www.allduniv.ac.in	www.mp.gov.in/HigherEducationMP/index.htm	http://dge.tn.gov.in	http://aghp.cag.gov.in
8.	www.aliah.ac.in	http://womentraining.gov.in	http://www.bankofindia.com	http://agup.gov.in
9.	www.amu.ac.in	https://www.karnataka.gov.in	www.allahabadbank.com/tenders.asp	
10.	http://www.pondiuni.edu.in	http://dhte.puducherry.gov.in	http://www.iob.in	
11.	http://www.physics.iitm.ac.in	http://www.mp.gov.in/dish		

5.4 Study Outcomes

5.4.1 Universities Websites

Table 5.2 shows that the accessibility testing results on eleven top most Universities websites in India in September 2012. The second column in table 5.2 indicates the universities website addresses. Columns III to IX exhibit the number of errors (automated computerized results) or problems in websites. Columns III and VI display the number of errors for WCAG 1.0 priority 1 (A level) and WCAG 2.0 priority 1 (A level), while columns four and seven display the issues for priority 2 (AA level) and columns five and eight contain issues for priority 3 (AAA level).

The Delhi University did well with 2 errors for priority 1 checkpoints in WCAG 1.0 and 3 errors for priority 1 checkpoints in WCAG 2.0, although they did have 1 & 3 errors in priority 2 checkpoint and 3 & 5 errors in priority 3 checkpoint in WCAG 1.0 and WCAG 2.0 respectively, that would require human intervention to manually check for WCAG compliance. IIT Madras had less errors in WCAG 1.0 guidelines while in WCAG 2.0 the website had numerous errors in all priority levels. For WCAG 2.0 priority A, AA and AAA levels, none of the University sites met the minimum requirement for passing these checkpoint levels except the Delhi University. For WCAG 1.0 priority A, AA and AAA levels, the Delhi University and the IIT Madras score the lowest errors.

But in the case of the other top nine Universities; website's design which were not based on the WCAG 2.0 and WCAG 1.0 guidelines. Hence assumptions were made that accessibility for disabled is show at lower.

Table 5.2 University Websites Accessibility Scores

S.NO	Web address	WCAG 1.0			WCAG 2.0		
		A error	AA error	AAA error	A error	AA error	AAA error
1	www.nagarjunauniversity.ac.in	17	23	28	19	164	173
2	www.iitm.ac.in	4	6	12	28	28	37
3	www.south.du.ac.in	2	1	3	3	3	5
4	www.annauniv.edu	25	22	42	37	39	39

5	www.unom.ac.in	24	24	27	27	28	30
6	www.andhrauniversity.info	8	23	31	19	25	41
7	www.allduniv.ac.in	18	28	37	30	37	52
8	www.aliah.ac.in	27	39	39	63	65	66
9	www.amu.ac.in	12	24	24	24	32	38
10	http://www.pondiuni.edu.in	42	53	53	42	62	69
11	http://www.physics.iitm.ac.in	64	64	64	89	113	130
	Average	22.0909	27.909	32.7272	34.6363	54.1818	61.8181

Figure 5.3 shows the mean error score of selected University websites in terms of WCAG 1.0 and WCAG 2.0 priority levels. When comparing WCAG 1.0 and WCAG 2.0 on priority level 1(A) most of the selected websites are implemented WCAG 1.0 guidelines and the mean score of WCAG 1.0 is 22.0909 and of WCAG 2.0 is 34.6363 respectively. As same as in priority level 2 and 3 (AA and AAA) the WCAG 1.0 mean is lesser, this indicates the WCAG 1.0 is implemented almost and WCAG 2.0 was not. The mean error score of AA in WCAG 1.0 and WCAG 2.0 is 27.909 and 54.181; the mean score of AAA in WCAG 1.0 and WCAG 2.0 is 32.727 and 61.8181 respectively.

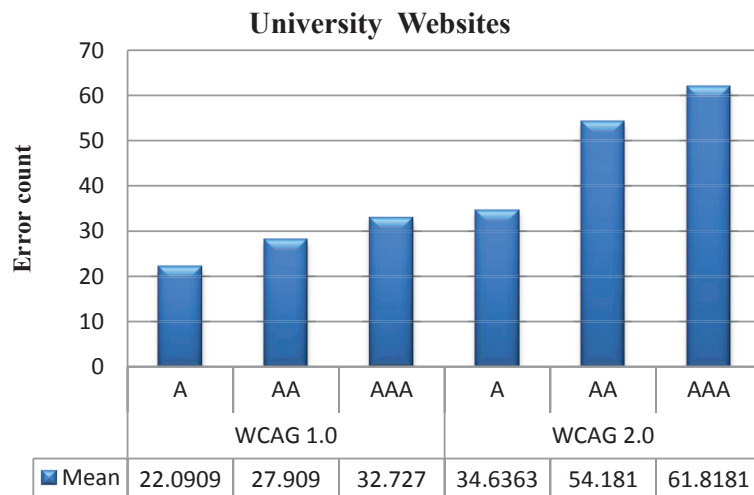


Figure 5.3 Mean Error on University Websites in terms of Priority Levels

5.4.2 State Information websites

Table 5.3 illustrates the accessibility results for 11 state wise information websites of India: 1.Tamil Nadu, 2.Delhi, 3.Gujarat, 4.Maharashtra, 5.kerala, 6.Rajasthan, 7.Higher Education, 8. Women training, 9. karnataka, 10.Pondicherry, and 11.parliamentary

websites. The Tamil Nadu government had announced some rules and regulations to support disabled people in cloud SaaS designing. This research shows that there is no one following the rules of the Tamil Nadu government and W3C guidelines.

In our research we have assessed the Tamil Nadu state information website with the help of A-Checker tool. The result of this research shows that the Tamil Nadu government website scored lot of errors in WCAG 1.0 and WCAG 2.0. The scores in 'A' level is 12 & 30 in WCAG 1.0 and WCAG 2.0 respectively. This indicates that the Tamil Nadu government website has not met with the minimum requirement of W3C (World Wide Web Consortium) guidelines to access the E-Governance services by the disabled community. In priority II AA level the error score is 12 & 47, in priority III 'AAA' level the error score is 29 & 47. As per the analysis stated above we conclude that the Tamil Nadu government's website is not based on the W3C guidelines and cannot be accessible for its citizens who are from the disabled community.

The Delhi state information website had zero error in WCAG 1.0 'A' level and 2 errors in WCAG 2.0 'A' level. This indicates that the Delhi website is designed based on the W3C guidelines, hence meeting the minimum requirement of disabled people expressed by the W3C. Moreover this website scored very less errors in level 'AA' & 'AAA'. 1 & 2 in level 'AA' in both WCAG 1.0 and WCAG 2.0, 3 & 2 errors in level 'AAA'.

The Gujarat state information website scores in level 'A', 'AA' and 'AAA' in both WCAG 1.0 and WCAG 2.0 is very high. ((26 & 33 in level 'A'), (34 & 23 in level 'AA'), (40 & 23 in level 'AAA')). This illustrates that the Gujarat government website is not accessible, as the website design is not based on the W3C guidelines, WCAG 1.0 and WCAG 2.0. At time when disabled people logon to this website they are unable to get any proper information needed by them.

The Maharashtra state information website has minimum errors in both (WCAG 1.0 and WCAG 2.0) W3C guidelines. The error level in checkpoint 1 in WCAG 1.0 and WCAG 2.0 is (1 & 5), in checkpoint 2 is 2 & 9, and in checkpoint 3 is 9 & 9. E-government website has approximately met the minimum requirement.

The Kerala state e-government website's error count based on AChecker tool in WCAG 1.0 and WCAG 2.0 is 25 & 34 in A level, 28 & 34 in AA level, 42 & 43 in AAA level. When tested with a single home page the errors are more in number.

The Rajasthan government website had the error count in WCAG 1.0 is (13 in A, 42 in AA and 48 in AAA) and in WCAG 2.0 is (21 in A, 63 in AA and 86 in AAA). The Higher Education government website had the maximum error count in selected websites and the error count based on AChecker tool in WCAG 1.0 is (52 in A, 61 in AA and 82 in AAA) and in WCAG 2.0 is (83 in A, 102 in AA and 123 in AAA).

The women training and parliamentary websites had a lesser error count in both WCAG 1.0 and WCAG 2.0 accessibility guidelines. Further, the Pondicherry and Karnataka government websites had considerable error count on their websites; this indicates the websites are troubled for disable people access.

Table 5.3 State Information Websites Accessibility Scores

S.N O	Web Address	WCAG 1.0			WCAG 2.0		
		A error	AA error	AAA error	A error	AA error	AAA error
1	www.tn.gov.in	12	11	29	30	47	47
2	www.delhigovt.nic.in	0	1	3	2	2	2
3	www.gujaratindia.com	26	1	40	23	23	23
4	www.maharashtra.gov.in	1	2	9	5	9	9
5	www.kerala.gov.in	25	28	42	34	34	43
6	www.planning.rajasthan.gov.in	13	42	48	21	63	86
7	www.mp.gov.in/HigherEducationMP/index.htm	52	61	82	83	102	123
8	http://womentraining.gov.in	4	2	8	12	15	20
9	https://www.karnataka.gov.in	23	53	61	45	62	62
10	http://dhte.puducherry.gov.in	18	19	37	29	36	39
11	http://www.mp.gov.in/dismh	4	3	8	15	29	29
	Average	16.18	20.27	33.36	27.18	38.36	43.90

As illustrated in figure 5.4; the state information websites are also had greater error count in WCAG 2.0 accessibility guidelines and lesser error count in WCAG 1.0 guidelines. The mean error count in WCAG 1.0 guidelines in all priority level is (16.8, 20.7 and 33.36) and the mean error count in WCAG 2.0 guidelines in all priority level is

(27.18, 38.36 and 43.90) respectively. This shows most of the designers are following the WCG 1.0 guidelines and in slightly WCAG 2.0.

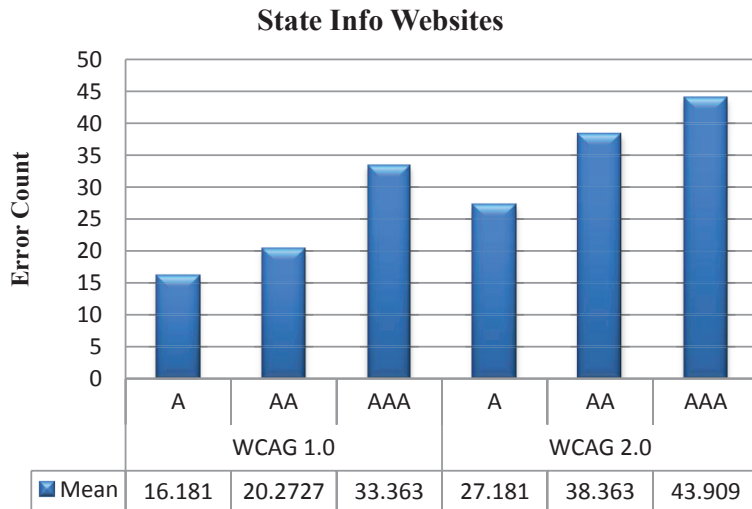


Figure 5.4 Mean Error on State Information Websites in terms of Priority Levels

5.4.3 Business and regulatory reform websites

Table 5.4 shows the accessibility results for the 10 E-Governance sites of Business Enterprises and Regulatory reforms like government services to citizens and enterprises (1.Bharat Sanchar Nigam Limited, 2.Southern Indian Railways, 3.Incometax, 4.Tamil Nadu Government Employment Office, 5.Tamil Nadu Electricity Board, 6.Waterresources, 7.Directorate of Government Examinations, 8.Indian banking Details, 9.Alahabad bank, 10. Indian Overseas bank).

The BSNL (Bharat Sanchar Nigam Limited) and Tamil Nadu Government Employment Office websites had no errors in priority 1 in WCAG 1.0 and 2 errors in priority 1 in WCAG 2.0 and very few errors in other two priority levels in WCAG 1.0 and WCAG 2.0. The Southern Indian Railway E-Governance site had fewer errors in WCAG 1.0 checkpoint 1 & 2; in checkpoint 3 this site had 532 errors. In WCAG 2.0 the errors in all levels is 508, 523 & 536 respectively. Other seven E-Governance website's accessibility scores are less but they are having some issues in all priority levels.

Table 5.4 Business and Regulatory Reform Websites Accessibility Scores

S.NO	Web Address	WCAG 1.0			WCAG 2.0		
		A	AA	AAA	A	AA	AAA
		error	error	error	error	error	error
1	www.bsnl.co.in	0	1	3	2	2	2
2	www.sr.indianrailways.gov.in	8	3	532	518	523	536
3	http://www.incometaxindia.gov.in	1	2	5	3	11	15
4	http://tnvelaivaaiappu.gov.in	0	2	3	1	3	1
5	http://www.tneb.in	1	2	4	3	3	4
6	http://waterresources.rajasthan.gov.in	39	39	40	56	67	74
7	http://dge.tn.gov.in	23	53	61	35	74	77
8	http://www.bankofindia.com	9	13	23	14	15	31
9	www.allahabadbank.com/tenders.asp	14	7	26	15	19	35
10	http://www.iob.in	3	4	7	4	7	11
	Average	9.8	12.6	70.4	65.1	72.4	78.6

Figure 5.5 presents the business and regulatory reform websites mean error score of three priority levels in terms of WCAG 1.0 and WCAG 2.0. As stated earlier in University and state information websites, most of the business and regulatory reform websites are implemented the WCAG 1.0 guidelines. The WCG 1.0 mean error score in priority level A is 9.8, in priority level AA is 12.6 and in AAA is 70.4 respectively. These websites are almost met the minimum level of accessibility according to WCAG 1.0 principles.

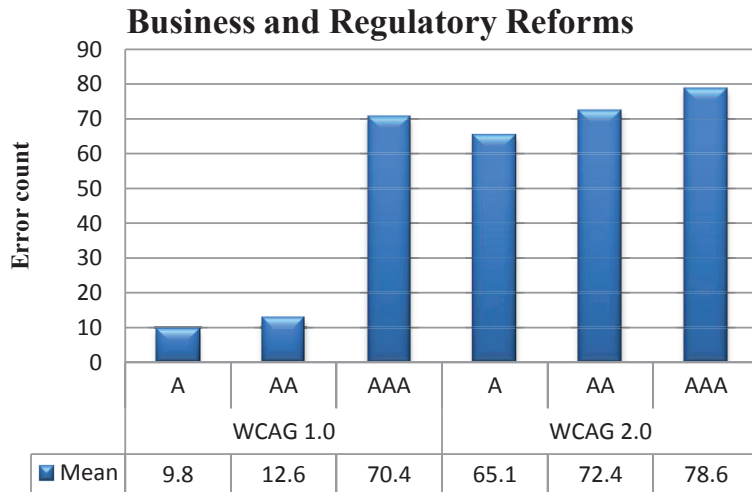


Figure 5.5 Mean Error on Business & Regulatory Reform Websites in terms of Priority Levels

5.4.4 Recruitment Board Websites

Table 5.5 shows the Accessibility scores of Recruitment board websites: 1.Railway Recruitment Board, 2. Union Public Service Commission, 3.Teachers Recruitment Board, 4.Tamil Nadu Public Service Commission, 5.Indian Banks, 6. Medical Recruitment Board, 7. Accountant General Himachalpradesh and 8. Accountant General Uttarpradesh.

The railway recruitment board website had met the minimum and the medium levels of accessibility .ie, in priority 1 & 2 this website had zero errors, in priority 3 this website had 4 errors in WCAG 1.0. In WCAG 2.0 this website had 4 errors in all priority levels. The Tamil Nadu Public service Commission’s website had zero error with respect to priority 1 in WCAG 1.0. Other six websites Union public Service Commission, Tamil Nadu Teachers Recruitment Board, Banks of India websites had high errors, Medical Recruitment Board, Accountant General Himachalpradesh, Accountant General Uttarpradesh websites had numerous issues on their home pages.

Table 5.5 Recruitment Board Websites Accessibility Scores

S.NO	Web Address	WCAG 1.0			WCAG 2.0		
		A	AA	AAA	A	AA	AAA
		error	error	error	error	error	error
1	http://www.rrbald.gov.in/	0	0	4	4	4	4
2	http://www.upsc.gov.in	3	5	7	5	5	5
3	http://trb.tn.nic.in	26	38	26	29	43	45
4	www.tnpsc.gov.in	0	26	34	12	41	41
5	http://banks-india.com	21	2	49	3	4	4
6	http://www.mrb.tn.gov.in	23	30	37	29	35	47
7	http://aghp.cag.gov.in	185	253	365	231	267	293
8	http://agup.gov.in	21	34	43	35	35	48
	Average	34.875	48.5	70.625	43.5	54.25	60.875

Figure 5.6 shows the mean error score of recruitment board websites in terms of three priority levels of WCAG 1.0 and WCAG 2.0. In these recruitment board websites the average error score of WCAG 1.0 and WCAG 2.0 in priority level A is 34.875 and 43; in priority level AA is 48.5 and 54.25; in priority level AAA is 70.62 and 60.875 respectively.

Here we can identify that the WCAG 2.0's priority level AA and AAA guidelines violation is lesser compared with the WCAG 1.0's priority level AA and AAA.

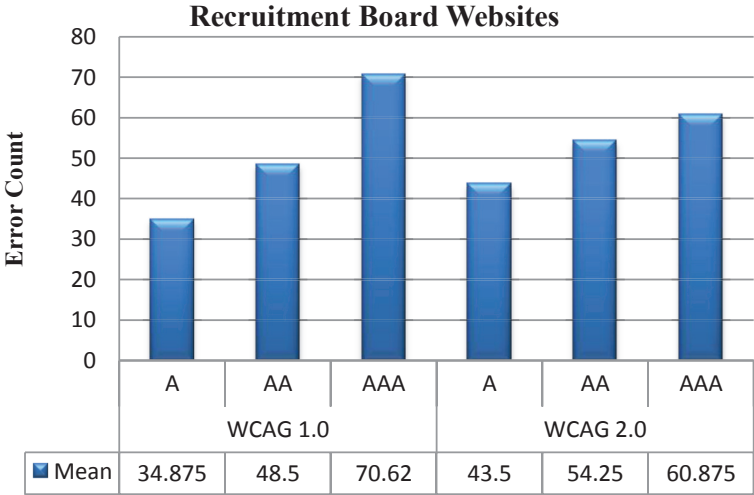


Figure 5.6 Mean Error on Recruitment Board Websites in terms of Priority Levels

5.5 Discussion

Awareness of web accessibility issues is increasing among the developers, even though many evaluation tools are now available to developers intending to improve the accessibility of their websites, the status of web accessibility, especially among E-Governance websites. Compliance with the specifications of web content accessibility is necessary to narrow the digital divide between the information and disabled people.

5.5.1 Level of Web Accessibility

None of the E-Governance websites satisfied all of the web accessibility requirements, which may be attributed to website developers knowing little about web accessibility standards, lack of effective and efficient evaluation and repair tools, and pressure to update information on the website quickly.

The fact that web accessibility, if ever considered, is often an afterthought once web content design is finished implies that program tools producing efficient, effective post-hoc repairs of web content accessibility violations or an accessible proxy server

transforming and filtering inaccessible online content for persons with disabilities may be more accepted by both the developers and website visitors.

5.5.2 Accessibility Among Different Categories

In the selected categories of E-Governance websites the Business and Regulatory Reform websites are the most accessible websites with the specification of WCAG 1.0 and second most accessible websites are state information websites with specification of WCAG 1.0. With the specification of WCAG 2.0, the state information websites are the first most accessible websites compared with other categories and the second most accessible are Universities websites. Figure 5.7 shows the average accessibility error score of different categories of E-Governance websites in terms of WCAG priority levels.

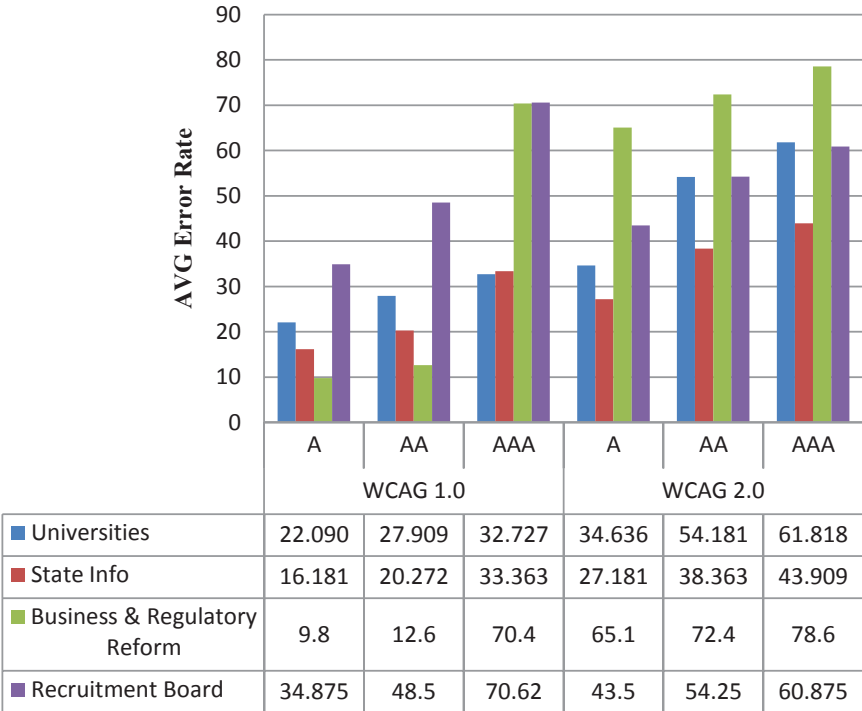


Figure 5.7 Accessibility Score Among Different Categories in terms of Priority Levels

5.5.3 Violations on WCAG 1.0 and WCAG 2.0

None of the tested websites, including the most accessible government sites, passed the WCAG guidelines; even though the six most frequently violated checkpoints have

technically uncomplicated solutions if designers pay attention to them. This may imply that the website editor simply overlooked the errors, and, for such editors, an automatic website monitoring program could be very helpful in identifying and correcting these errors on their website.

The first most violated guideline was the alt text content doesn't have alt text description. The alt text content must be included in images, smilies, animations, graphic images, tables and frames. Second most frequently violated guideline was that reported the clustered displays of web pages most importantly misplaced of title contents and missed title contents. Third violation is not providing enough time to read content for the disabled users (most of the tested websites are used marquee content and timestamp attributes, this will affect the disabled people access).

The fourth most violated checkpoint was the usage of dead links, almost all of the websites having dead links. Dead links are the links which will not direct any web pages or websites. Fifth most violation was the contrast between the of visited link text and its background for the element. The last most frequently violated checkpoints are the fixed font size, fixed scheme, fixed layouts and fixed form of supporting language (i.e., almost all of the website's text are in English only, there is no option to change language).

5.6 Summary and Conclusion

This study evaluates the current state-of-accessibility of E-Governance websites for persons with disabilities in terms of WCAG 1.0 and WCAG 2.0 with automatic evaluation tools of four different categories of E-Governance websites. The results shown that the maximum of Indian E-Governance websites are not meeting the needs of their disabled constituents in providing adequate levels of accessibility needs, and a very few E-Governance websites come close to passing disability testing guidelines or legal mandates.

The strong legal policy supports the possibility that sites will be more accessible to persons with disabilities and preventing from digital divide (Kuzma et al. 2009; Rahim 2013).

To achieve a high level of web accessibility is the responsibility of both the individual governments as well as web administrators. The combination of legal and technical methods should be combined to achieve a higher level of compliance in accessibility.

For this government need to not only implement laws, but must find ways to ensure compliance with their mandates and impose sanctions if they are not met. The web administrators also play a critical role in ensuring their websites adhere to government laws and industry standards. As the worldwide usage of E-Governance websites expands, both groups should work to ensure that their disabled persons have equal access to E-Governance websites, thus benefitting a much larger group of constituents.

The next chapter describes about the evaluation and outcomes of accessibility of Indian E-Governance websites by manager's and content developer's perspective in order to address the root cause of accessibility issues in India.