A Case Study of Web Accessibility on Tamil Nadu Public School System

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ABSTRACT

As the World Wide Web becomes one amongst the communication channels between School Districts and their community of stakeholders, the necessity to supply equal access and equal opportunity to people with disabilities associate degree isn't any longer simply a moral issue however a legal obligation. This paper tests the 200 entities within the Tamil Nadu public school system using the Bobby Software. The results show that almost all of the websites fail to satisfy the minimum needed Standards: Section 508 guidelines and Web Content Accessibility Guidelines (WCAG) priorities.

Keywords
TNPSS, Web Accessibility, Bobby Software

1. INTRODUCTION

The Web is necessary for nearly everyone because it is one amongst the newest and most advanced media in several aspects of our lives: Education, Employment, Government, Commerce, Health care, Recreation, and more. Web sites, like buildings, should be designed to satisfy the requirements of all people, as well as those with disabilities. The Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C) defines web accessibility as "meaning that people with disabilities will perceive, understand, navigate, and interact with the online, which they will contribute to the online. Web accessibility conjointly edges others, as well as older people with dynamic skills thanks to aging [36]."

Nowadays, the web plays associate degree increasing integral role in education for the delivery of academic, body, and student services. Web content typically contains necessary information about educational resources, field events, and body policies. The Tamil Nadu establishment supports more or less 4.5 million students; among them, 486,887 (10.6%) is a unit classified as special desires [2], a big portion of the users for the Tamil Nadu establishment. Not only do Tamil Nadu public faculties have associate degree moral obligation to make sure that the scholars with disabilities they serve have equal access to on-line services, however they're conjointly mandated by Section 504 of the Rehabilitation Act to make sure that each one students have equal access to evenhanded education and programs [37]. "No otherwise qualified individual with an incapacity within the United States . . . Shall, alone by reason of her or his incapacity, be excluded from the participation in, be denied the advantages of … any program or activity receiving Federal monetary assistance . . . " [29]. The Americans with Disabilities Act [1] reinforces and extends Section 504 to public programs and services, despite whether or not or not these programs and services area unit federally funded.

2. REVIEW OF LITERATURE

A number of studies are conducted to analysis the standards, tools, and legislation supporting accessible internet development. Some previous studies have shown that a lot of web pages stay inaccessible to users with disabilities.

2.1 Web Accessibility in Teaching

Many revealed studies have evaluated the accessibility of elite web content at institutions of higher education. Schmetzke completed a study of the 56 North yank schools that offer yank Library Association (ALA) -accredited programs in library and knowledge science [27] and therefore the home pages of 1051 community schools [28]. He found that 77 of university and junior college web content contained a minimum of one accessibility error. [25] evaluated a random sample of four hundred distinguished U.S. colleges, universities, and online learning establishments and located that fewer than 25% university home pages met the minimum accessibility criteria. [32] manually evaluated essential web content of 102 public analysis universities employing a 5-point rating scale that centered on every site's "functional accessibility." [39] used accessibility testing tools to look at the usability and accessibility of the highest 50 universities within the U.S. They found that solely 15 of the 50 university sites were freed from WCAG Priority one accessibility errors, and solely seven sites passed each usability and accessibility tests. [16] researched the accessibility of the a hundred high international universities. They planned a comprehensive methodology of testing websites and showed that accessibility was still a drag for several of the highest universities worldwide.

2.2 Web Accessibility Analysis Tools

Some analysis tools will facilitate confirm accessibility [5]. The simplest known is a Bobby, developed by the Centre for Applied Special Technology [7] and currently owned by Watchfire. Bobby mechanically evaluates the accessibility of web content on a variety of objective measures [25] [27]. Some a lot of machine-driven analysis tools like Greek deity Says, utilize WCAG and Section 508 accessibility guidelines [16]. Functional Accessibility judge (FAE) evaluates websites and provides authors with direct feedback about accessibility in many classes [12] and WebInSight which detects what impedes access to the online and offers suggestions to enhance access [6]. However, several of the authors noted the shortcomings of machine-driven analysis tools normally. Because the World Wide Web Consortium (W3C) points out, "Some of the web-content accessibility checkpoints can't be checked with success by software package algorithms alone. There'll still be a dependence

on the user's ability to exercise human judgment to seek agreement to the guidelines" [38].

Some studies have combined the utilization of machine-driven analysis tools with a manual process. [24] planned a regular accessibility analysis method that mixes the utilization of a Bobby, a W3C hypertext mark-up language validation tool, and a manual analysis that includes each general and elaborate inspections. [15] used Bobby, W3C HTML validator, a screen reader, screen magnification software package, and a birth defect machine. Also, [10] supplemented Bobby with a simulated application method during which every website was navigated employing a screen reader and keyboard.

A few studies used solely manual processes in evaluating on-line library information services for accessibility. [13] conducted a survey via email to eleven blind and visually impaired shoppers of the Canadian National Institute for the Blind Library. Within the survey, she instructed the themes to perform specific tasks with totally different on-line library databases and to rate the overall accessibility of every information. [4] Manually checked on service for agreement to the Section 508 web accessibility standards.

2.3 Achieving web Accessibility

Finally, some literature revolves round the accomplishment of web accessibility. [31] stressed that dissemination of accessibility standards and adoption of accessibility guidelines by web authoring tools don't seem to be enough. They argued that web content ought to be viewed in an exceedingly abundant larger social context which the role of the web page can't be separated from its accessibility. [31] observed that successful delivery of accessibility depends on a developers' awareness of the accessibility aspects concerned. [23] offered associate degree "accessibility first" approach to web design; he proposed associate degree accessibility initial pedagogy for web style. [8] Conjointly argued that web access required to be enclosed within the style process instead of be a post-design method. They conjointly showed that designers cannot bank alone on authoring and style tools. Web access needs human intervention and examination. [18] checked out the necessity for accessibility

personnel to figure with web developers from the start and therefore they have to be compelled to share a cooperative work setting. Accessibility shouldn't be alone a part of the post-design method. [14] sets a framework for knowledge domain groups to form accessibility guidelines. The knowledge domain team includes accessibility and web development members. [22] more stressed the need for designers and accessibility personnel operating along with showing that accessibility and design area unit joining, and each area unit connected to internet standards. Lastly, [11] showed that with web 2.0 turning into a lot of prevailing, users with disabilities is also unaware of how to move with the dynamically created wealthy user interfaces. This highlights the necessity for accessibility to be thought of as a part of the look method.

2.4 Web Accessibility Standards

Web accessibility is unmoving in 2 sets of guidelines: Section 508 of the Rehabilitation Act and therefore the Web Content Accessibility guidelines (WCAG). Section 508 is remitted by law and applies to the websites of all federal agencies and organizations that receive federal monies [30]. Whereas not backed by law, the WCAG is an element of the World Wide web Consortium's (W3C) Web Accessibility Initiative (WAI), and it plays an essential role in establishing web site accessibility standards. Section 508 and WCAG share some commonplace guidelines, and therefore the W3C WAI is functioning with the U.S. Access Board the federal agency accountability for Section 508 to revise and update Section 508 guidelines [36]. Owing to this reality, it behooves all federal organizations to exceed the mandated Section 508 guidelines, and succeed full compliance with WCAG likewise. Section 508

Section 508 is enclosed within the 1998 change to the Rehabilitation Act, U.S. Public Law 105-220. It consists of sixteen paragraphs that target dissolving barriers that inhibit persons with disabilities from accessing info technology (IT) resources. Table 1 provides a summary of section 508 necessities.

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Table 1: The Sixteen Paragraphs of Section 508

Paragraph	Short Description
(a)	Provide alternate text for images
(b)	Synchronize alternates to multimedia presentations
(c)	Convey information displayed solely in color in another way
(d)	Ensure that pages are readable without its style sheet
(e)	Provide text links for server side image maps
(f)	Use client side image map when possible
(g)	Identify headers and footers in all tables except those used for layout
(h)	Identify tables that have two or more rows or columns that serve as headers
(i)	Give each frame a title
(j)	Make sure that the screen does not flicker quickly
(k)	Provide a text only page for a site that cannot be made accessible
(l)	Provide alternate text for scripts that convey information
(m)	Give a link for accessible plug-ins
(n)	Make sure to associate form controls and their labels
(o)	Allow user to skip repetitive navigation links
(p)	Give notification and extensions of timed responses

Currently Section 508 solely applies to the centralized or businesses and to organizations that receive federal monies [26]. By extension, this means that each one state governments and their several agencies area unit subject to 508 guidelines. For the aim of this paper, we have a tendency to area unit work the Tamil Nadu public establishment.

Given that Section 508 addresses the accessibility of knowledge technology, it is important to notice that accessibility doesn't guarantee usability [21]. An important distinction must be processed. Online page usability refers to users' ability to seek out the information they have on a web site. Web Content accessibility refers to internet services that support disabled user populations. Accessibility doesn't imply usability, and the other way around. Usability, or design, and accessibility area unit presently joining, and each place confidence in web standards to realize maximum potential [22]. However, the actual fact that web content meet accessibility guidelines doesn't guarantee that a user with disabilities are going to be ready to use the web content without problems [34]. The truth is that Section 508 guidelines don't mandate usability, solely accessibility.

Because we have a tendency to used the machine-driven software package Bobby during this study, solely paragraphs (a), (i), and (n) of Section 508 will be expressly tested. The remaining paragraphs all need human investigation or manual verification. For instance, analysis software package will simply be tested to verify that each one pictures have alternate text (paragraph (a)); but, it's harder to verify that a website is legible while not its an associated piece of paper (paragraph (d)). W3C WCAG Priorities

Unlike Section 508, the Web Content Accessibility guidelines (WCAG) isn't needed by law. It had been developed in 1999 by the World Wide Web Consortium's (W3C) Web Accessibility Initiative [9], and supported by the U.S. Department of Education's National Institute on incapacity and Rehabilitation analysis. WCAG provides a group of checkpoints that internet developers could follow to make sure that their sites area unit access to a better kind of users. WCAG defines 3 levels of internet accessibility, Priority 1 (P1), Priority a pair of (P2), and Priority three (P3). The priorities don't cascade, therefore, a website could meet all the necessities of P3 and still fail to satisfy the P1 and P2 requirements. Every WCAG priority consists of assorted guidelines. 14 guidelines compose the WCAG framework. Each guideline is weakened into individual checkpoints. For instance, guideline one is shared between P1 and P3. P1 consists of check point 1, 1.2, 1.3, and 1.4, whereas P3 contains checkpoint 1.5. The WCAG and 508 share some common parts which can be explored in the next segment.

In WCAG, a web site should satisfy all P1 checkpoints to be thought of minimally accessible. Therefore, P1 may be a basic demand for web content. P2 identifies checkpoints that area unit recommended; not meeting the P2 necessities indicates that some people could have a problem with the webpage content. P3 checkpoints area unit the last checkpoints needed to complete web page accessibility. Those pages that fail to satisfy P3 can realize that a number of people will expertise bother viewing the web page [35].

Like 508 guidelines, the WCAG can't be utterly tested mistreatment software package analysis tools. In fact, most of the checkpoints need manual verification. The necessity for manual verification plays a crucial role decide the way to address web site accessibility and is further mentioned later. This paper is predicated on the 1999 WCAG 1.0 guidelines. The W3C is currently advising on updates to the 508 guidelines whereas at the identical time developing WCAG 2.0 guidelines.

Commonalities

The Section 508 and WCAG guidelines share many common necessities. The table below shows the overlap of 508 and WCAG.

Table2: Commonalities between Section 508 guidelines and WCAG 1.0 guidelines.

Section 508 Guideline Paragraph	WCAG 1.0 (Priority, Guideline. Checkpoint)
(a)	P1, 1.1
(b)	P1, 1.4
(c)	P1, 2.2
(d)	P1, 6.1
(e)	P1, 1.2
(f)	P1, 9.1
(g)	P1, 5.1
(h)	P1, 5.2
(i)	P1, 12.1
(j)	P1, 7.1
(k)	P1, 11.4
(n)	P2, 12.4

A web page that conforms solely to P1 guidelines won't meet the minimum 508 guidelines as stipulated by law, as a result of Section 508's paragraphs (l), (m), and (n) don't seem to be included in Priority 1. Table a pair of conjointly solidifies the necessity for web content to maneuver on the far side Section 508, and succeed higher accessibility by implementing P1 and P2. As mentioned earlier, the W3C's WAI is closely connected to the event of the revised 508 guidelines. This table also represents the selection to check the college district web content against the present WCAG 1.0 Priorities.

3. RESEARCH METHODOLOGY

In this paper, associate degree assessment of Tamil Nadu public establishment websites is conducted to measure their web accessibility against Section 508 guidelines and WCAG priorities. Possible solutions to the problems known area unit offered, and in a lot of the world approach (within the scope of

the Tamil Nadu public School system) to web accessibility is framed later.

3.1 Evaluate ways

The primary tool employed in this paper is WatchFire Bobby software package [25] [27]. Bobby permits users to scan entire websites or single web content. All pages can be compared to 508 guidelines and everyone 3 priorities of the WCAG. The secondary instrument employed in this study was Microsoft Access. All information collected from the Bobby software package was entered manually into associate degree Access information. A tiny low application in Visual Basic .Net 2005 was written to make sure the accuracy of knowledge entry and to assist analyze the information. Finally, this study used the raise Tamil Nadu Education Directory (TED, 2008) web site so as to make sure an entire, up-to-date, correct list of all the Tamil Nadu Local Education Agencies (LEAs). The TED website is maintained by the Tamil Nadu Education Agency (TEA), and acts as a public repository of LEA information.

3.2 Selection of websites

Web sites were chosen as being operated by the entity in question. For instance, McLennan County Juvenile Correctional Facility I & II area unit LEAs and do have a web presence. However, their "website" is indeed a 1 page informational section underneath the abundant larger Tamil Nadu Youth Commission web site. As such, McLennan County Facilities don't seem to be thought of at intervals the boundaries of this analysis and area unit indicated as not having a web site. For every electronic computer, only the home or front page is tested thanks to the restricted time constraints and therefore the size of the Tamil Nadu LEA websites. If a web site has flash introductions before incoming at the verity content home page, the introduction online page was skipped and therefore the home page that provided navigation and knowledge was examined.

For each web page tested against the Bobby, the quantity of P1, P2, P3, and 508 violations were recorded. The rules that were profaned were recorded instead of the entire variety of violations per guideline. For instance, a web page could have 25 specific instances of pictures without alternate text; but, just one violation was recorded in the several web pages. All web pages were tested from June 2012 through September 2012. All LEAs that had websites down throughout now were revisited 3 times so as to make sure an entire list.

Because several of the 508 and WCAG priorities area unit subjective, solely the target errors produced by Bobby were recorded. For instance, the 508 guideline - paragraph (a) - indicates that all web pictures ought to have associate degree alternate text. As such, this guideline is objective as a result of it can simply be known and cataloged. However, the 508 guideline paragraph (d), which needs documents to be organized so that they area unit legible while not requiring an associate degree associated piece of paper, is a subjective matter (depending on however one defines readable), and can't be expressly tested with the automatic software package. This side of web accessibility testing indicates clearly that no single software tool will produce internet accessible web pages; additionally, manual investigation is additionally required.

4. RESULTS

This analysis investigated 200 Tamil Nadu school & college entities listed on the TED website. The total variety of entities include all local school & college districts, regional centers, and TEA. For simple understanding, the analysis is divided into four parts: 508 guidelines, P1, P2, and P3 of the WCAG.

4.1 Overall Statistics

Only 80 out of the 200 LEAs area unit testable, the principle for not testing a 32 districts is elaborate within the previous section. The table below shows the breakdown of total faculties tested, and therefore the variety of LEAs that passed 508 guidelines, P1, P2, and P3. Of the tested websites.

Table 3: Results of LEA Accessibility Analysis

Total Districts Tested	25	78.125%
Total Districts Not Tested	7	21.875%
Total Districts	**32**	
Passed 508	36	12.89%
Passed P1	13	16.65%
Passed P2	7	0.72%
Passed P3	4	0.45%
Passed All	1	0.09%

4.2 Section 508 guidelines

To retell, Section 508 consists of sixteen paragraphs, three of which may be expressly tested mistreatment the Bobby software package – paragraphs (a), (n), and (i). Table four shows a breakdown of the three 508 guidelines. The foremost prevailing error is a paragraph (a) that accounts for 80% of all errors; this result is in keeping with previous analysis into website accessibility [20] [27].

Table 4 . Breakdown of 508 guidelines.

Section 508 Paragraph(s)	Number of Violation	Percentage
(a) only	80	50.05%
(i) only	26	13.87%
(n) only	24	4.93%
(a) and (i)	35	3.80%
(a) and (n)	30	24.67%
(i) and (n)	6	0.82%
(a), (i) and (n)	9	1.85%

4.2.1 P1 Priorities

In Priority one, guidelines 1.1, 6.2, and 12.1 will be tested by a Bobby. Priority 1 and Section 508 share several common guidelines. P1 1.1 and P1 12.1 correspond to paragraphs a and that i respectively in Section 508. The remaining priority 6.2 pertains to border sources.

Table 5 . Breakdown of Priority 1 guidelines.

P1 Guideline	Number of Violation	Percentage
1.1 only	78	77.44%
6.2 only	2	0.64%
12.1 only	38	8.49%
1.1 and 6.2	5	0.64%
1.1 and 12.1	27	3.11%
6.2 and 12.1	37	6.87%
1.1, 6.2 and 12.1	13	2.79%

4.2.2 P2 Priorities

WCAG P2 represents the biggest set of guidelines that may be expressly tested. P2 contains some specialized errors such 7.2 (blinking text) and 7.3 (marquee text). A number of the errors will be resolved by abstaining from mistreatment deprecated XHTML parts and wishing on CSS to realize desired style effects.

In order to modify the table show, the errors that violate one guideline solely and a lot of were combined into one class. Like row "3.2 and more", 532 violations can be the online site that solely violate 3.2 guideline or violates 3.2, 3.4, and 7.2 etc which incorporates 3.2.

Table 6 . Breakdown of Priority 2 of guidelines.

P2 Guideline	Number of Violation	Percentage
3.2 and more	80	47.97%
3.4 and more	22	99.82%
3.5 and more	14	9.56%
6.5 and more	3	0.36%
7.2 and more	7	0.99%
7.3 and more	33	13.80%
7.4 and more	3	0.36%
7.5 and more	1	0.09%
9.3 and more	14	43.37%
12.4 and more	11	28.31%
13.1 and more	8	69.07%
13.2 and more	9	1.62%

The highest share of violations is returning from guidelines 3.4 (use relative filler and positioning), 13.1 (avoid mistreatment identical link phrases over once per page), 3.2 (use public text identifiers within the doctype statement) and 9.3 (event handlers don't need the utilization of a mouse).

Priority 3 guidelines could represent the foremost troublesome guidelines for designers to satisfy. Almost all websites, 99.9% fail to satisfy P3 guidelines, principally owing to the utilization of tables to form layout frameworks [40]. Guidelines 1.5, 4.3, 5.5, 0.4, and 10.5 were tested. Designers must weigh the price of reconstruction a web site with web standards against the tiny population of users United Nations agency can like meeting priority 3 guidelines.

P3 Priorities

Table 7 . Breakdown of Priority three guidelines.

P3 Guideline	Number of Violation	Percentage
1.5 and more	7	9.35%
4.3 and more	69	84.62%
5.5 and more	79	87.05%
10.4 and more	24	24.28%
10.5 and more	21	65.65%

5. CONCLUSIONS

The World Wide Web has long outgrown its novelty to become a vital role within the activities of current public college systems. Federal laws need state faculties to supply accessible websites for persons with disabilities. In our analysis, we have a tendency to test the entities at intervals Tamil Nadu public establishment against section 508 guidelines and WCAG. Sadly, results showed that almost all Tamil Nadu public faculties did not meet these obligations, maybe thanks to developers' mental object and misconceptions that sanctioning access is pricey and time-consuming. During this paper, the role of accessibility in web style is investigated and a holistic approach to achieving web accessibility is planned.

In this paper, solely machine-driven software package Bobby is employed to gauge the accessibility of web pages on a variety of objective measures; solely some of the paragraphs of Section 508 and WCAG guidelines area unit tested. Some manual processes can be additional in future studies to permit a more general analysis on service for agreeing to the Section 508 internet accessibility standard.

Another fascinating finding from this study is that the realization that 3 pillars support web development. Usability, accessibility, associate degrees web standards all play an interconnected role in developing websites. Several of the accessibility guidelines area unit aimed toward universal usability. For example, the accessibility guidelines for forms serve a twin purpose for accessibility and usability. Moreover, several of the accessibility issues will be resolved mistreatment linguistics markup, and web standards. Per [31], accessibility encourages the separation of content from information, that is that the question of web standards. Moreover, paragraph (d) of Section 508 needs that each one web content stays legible while not their associated piece of paper. Readability while not the associated vogue sheets will simply be achieved once content is separated from information. A lot of analysis must be wiped out relevancy the reticular affiliation among these 3 fundamentals of web style.

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