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Accessibility Compliance Evaluation for Small and Medium Enterprises with Web Platforms in Nigeria

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Abstract

Websites need to be accessible, compliant and conform to the web accessibility rules in order to be used effectively by every individual with disabilities or not. In this study, an attempt was made to check if there is significant effort on the part of business owners in Nigeria to accommodate disabled users by meeting the requirements of all different users using various tools along with observations and testing. This paper thereby seeks to investigate the compliance level of Small and Medium scale enterprises in Nigeria if they meet the basic rules of web accessibility. In this study, a checklist was derived in accordance with the principles of the web content accessibility guidelines. Data were collected across 52 convenient websites distributed across Nigeria. The result showed that there was positive approach by both web designers and business owners towards the adoption of accessible websites for all. With the progression towards the adoption of accessible websites, as a form of business advantage in the current economic environment many businesses found wanting in this regard will in no time follow suit. It is thereby recommend that business owners opt for accessible and correctly design websites.

Keywords: Web accessibility, Disabled users, Small and Medium Scale Enterprises (SMEs), Web Content Accessibility Guidelines (WCAG), E-Commerce.

1. Introduction

Business can be regarded as any economic activity which must focus on continuous and regular marketing of products services so as to meet the requirements and needs of people in the society (Schor, 2016). In Nigeria, Small and Medium Scale Enterprises (SMEs) are defined based on their capital, project cost, number of employees, annual business turnover, financial strength and sales volume (Ayozie, Oboreh, Umukoro & Ayozie, 2013). Nigeria Ministry of commerce, Small and medium development agency consider SMES as enterprises with total assets above five million naira; excluding Land and building but not exceeding five hundred million naira and a total workforce of above ten employees, not exceeding 199 (Umeh & Adeola, 2013).

The consistent surge in the number of internet users in the country has increased from 200,000 in the year 2000 to over 111 million users in 2018 (Bankole & Adio, 2018), which has positioned Nigeria as one of the leading internet users in sub-Sahara Africa (Bankole & Adio, 2018). This information shows that with the enhancement of business; there is need for websites and applications to conform to accessibility rules which is cost effective and a sound business practice. The benefits of web accessibility stretches beyond considering the disabled, but to the fact that accessible design principles increase usability and thus leads to a desirable profit outcome.

A survey carried out as of February 2015 shows that 65% of Nigerians have already shopped online making room for conclusions that with improved internet security, the remaining 24% are liable to lean toward



online shopping (Oxford Business Group, 2016). With E-commerce, everyone is a potential consumer-including the disabled. According to African Disability Rights Yearbook, the percentage of Nigerians with disabilities provided by the 2006 Nigerian census was 3,253,169 that is approximately 2.32% of the 140,431,790 population (Web accessibility and older people, 2012). The World Wide Web Consortium (W3C), being the body that oversees all issues concerning the World Wide Web emphasize that accessibility enables the disabled (visual, auditory, physical, speech, cognitive, and neurological or a combination of all these) use the web more efficiently, by ensuring they navigate, understand, perceive and interact with the web (Web Accessibility Initiative, 2015).

The Web-based web site accessibility evaluation tools is a handy resource for anyone who wants to ensure that the site they are developing meets established accessibility standards by spotting potential errors. There is need to ensure that the web site is accessible as part of the aspects that ultimately make it usable. These standards or guidelines are seen as reference points on which most of these tools are based. These may include the w3c's <u>WCAG 1.0</u> and <u>2.0</u>, section 508, the <u>Stanca Act</u> (Italian accessibility law), <u>BITV</u> (web accessibility test of the German big project), <u>RGAA</u> (French accessibility law) or a combination of them. Some tools also have their own accessibility guidelines (Dingli & Mifsud, 2011). Other assistive tools exist that could check specifically for a particular feature such as Checkmyclours, Peat and Readability Index Calculator which can be used to analyze color contrast, check flicker rates and examine the readability of text content respectively (Dingli & Mifsud, 2011).

It is no secret that the prosperity of SMEs is proportional to the opulence of a country; it has also been a great source of concern due to the fact that the vital sub-sector has fallen short of expectation. The situation is more disturbing and worrying when compared with what other developing and developed countries have been able to achieve with their SMEs. For many people with physical disabilities, ICTs can be extremely useful in providing access to communication, education and open up opportunities for them. The use of Braille keyboards and printers can help alleviate some common literacy and numeracy problems for visually impaired or blind people. Most telecommunications infrastructures are now being designed with the capabilities of meeting the special needs of the physically challenged.

However, this study will determine and compare the level of accessibility and impression of customers in various E-commerce sites belonging to Small and Medium Scale Enterprises (SME's) in Nigeria. These SMEs are owned by Nigerian entrepreneurs that are registered under the Corporate Affairs Commission (CAC). This study would strive to answer questions on the extent of accessibility awareness for businesses, how easy is it to use an E-commerce site? What are the problems faced by users? What are the reasons for these deficiencies? How could these problems be tackled?

It is expected that the outcome of this study will identify weak spots and address them by imbibing accessibility practice into both teaching, learning and designing of websites, so as to ensure that New and existing businesses take note of the consequences of designing accessible websites by way of appealing to their target market and imbibing the practice of tolerance when opting for a website. The study would therefore be of benefit to businessmen, web designers, managers, developers, policy makers and researchers, which would thereby assist in increasing product efficiency and profit in businesses.

2. Related Works

The Web Content Accessibility Guidelines (WCAG) Working Group is probably the most well-known working group in Web Accessibility Initiative (WAI); the Web Content Accessibility Guidelines 1.0 are often simply referred to as "the WAI guidelines," even though WAI also produces other guidelines and specifications (Web Accessibility and Older People, 2012). Web accessibility is the provision and application of technological solutions to a website design so as to ensure its accessibility to users, particularly people with disabilities; like the partially sighted people or other users of assistive technologies so as to ensure they use the website with ease and



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comfort (Brophy & Craven, 2007). With the increasing number of people with disabilities, the need for web accessibility compliance remains very important to every organization or institution (Nir & Rimmerman, 2018). The need for web accessibility evaluation cannot be over emphasized, such that it enables the disabled to manoeuvre around the web and make necessary contributions (Song, Bu, Artmeier, Shi, Wang, Yu & Wang, 2018). There are several people living with disabilities, which include; visual, auditory, physical, speech, cognitive and neurological disabilities, these disabilities has affected their use of ICT in one way or the other (Web Accessibility and Older People, 2012). These disabilities are highlighted below:

Vision – consists of reduced contrast sensitivity, colour perception, and near-focus, making it difficult to read web pages. Blind or visually impaired people often use assistive technology such as screen reader, which allows them to visualize and access information on the website effectively. Other assistive technology like the braille display can also be used to convert them by the texts of websites to Braille. Keyboard as well can be used to navigate around on a screen and get necessary feedback (Web Accessibility and Older People, 2012).

Physical ability –People who have difficulty using the mouse or keyboard; due to moving the cursor and navigating around on a web page can use assistive technology to allow them control and give verbal commands. Reduced dexterity, difficulty in using a mouse or keyboard, manual dexterity or hand-eye coordination, fine motor control are some of the characteristics of people with physical ability challenges. Mouse and keyboard alternative assistive devices or helper applications such as a head wand or voice recognition software can also be used.

Hearing –These consists of individuals' that have difficulty in hearing higher-pitched sounds, separating sounds, podcasts and some other audio sounds, most especially when there is a background noise. Captions or titles can be used on streaming video for the deaf or hearing impaired. Additionally, amplified sound can be provided to enhance communication for those individuals.

Cognitive ability - Reduced short-term memory, difficulty in assimilation, brain injury and easy distraction are some of the challenges that lead to difficulty in navigating and completing online tasks. Individuals with cognitive impairments and neurological disabilities have challenges in using the websites due to lack of illustrative non-text materials, lack of consistent navigation structure, and flickering or blinking design elements (Giannoumi, Land, Beyene & Blanck, 2017).

Generally, the major challenges on websites are from images or photographs that are not well captioned or labelled, as a screen reader or similar assistive technology cannot read an image (Web Accessibility is smart Business, 2015). Most evaluators conclude that it is better to embed accessibility practices into the design and creation process rather than trying to fix it after web publication. As gathered, accessibility evaluation can be conducted either manually or automatically. The manual method entails using a WCAG as a checklist which is an inventory of the requirements for an accessible website and is usually performed by an expert. The automatic method involves using an automated tool to check for errors and give suggestions based on the URL entered into the search bar. Most times, evaluation method is combined for optimum results (Calvo, Iglesias & Moreno, 2014).

Oyefolahan, Onuja & Zubairu, (2018) evaluated the web accessibility and compliance level of ten airline website form registered airlines in Nigeria. It used some automated tools like A-Checker tool, European Internet Inclusion Initiative (EIII) e-accessibility tool, WAVE web accessibility evaluation tool (WAVE), Functional Accessibility Evaluation Tool and Mobile Friendly Test to check for the level of compliance with Web Content Accessibility Guidelines (WCAG). The results showed that most of the websites do not conform to the accessibility guidelines expected of commercial airlines.

The accessibility performance of some state government websites in Nigeria was evaluated using the TAW and site analyser automated tools, with the aim of testing their conformity with the Web Content Accessibility Guidelines. Results showed that there is no significant difference in the performance of the websites amongst the different states as most of the websites conformity tested above average (Adepoju, Shehu & Bake, 2016).



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Rodríguez, Pérez, Cueva & Torres, (2017) proposed a framework to improve the web accessibility and usability of Open Course Ware sites. The EM-WCAG 1.0 evaluation methodology of the Web Accessibility Initiative (WAI) was used to evaluate the accessibility of the Open Course Ware sites if it meets the individual requirements and accessible to the disabled. The findings showed that there is a need for more research work to be done on the accessibility and usability of websites. An independent body with huge concern for the disabled came up with a framework, based on their opinion on the requirements of the disabled showing that the idea of web accessibility is somewhat flexible and as such, businesses can narrow down to accommodate for certain disabilities (SMEDAN, 2013).

Most organizations have a website and most of these websites were developed without considering accessibility. Therefore, most websites in use by businesses have accessibility barriers, making it difficult for the disabled to access. These barriers range from significant to minor, reducing the amount of barriers. The implementation of accessibility on an existing website could be somewhat overwhelming. There are approaches businesses in this situation can take to make the process more effective and efficient by fixing or repairing accessibility barriers/problems with existing websites. There are basically four (4) steps to this, which are; Understanding the basics; Develop a plan for repairs; prioritizing the repairs; addressing next steps after retrofitting (Web Accessibility Initiative, 2015).

3. Methodology

This study is web based but as population is concerned, all subjects under evaluation are Nigerian based enterprises, that is; SMEs which have their operation and headquarters in Nigeria. A total number of 36,994,578 SMEs is the current figure as of 2013. SMEs in Nigeria is categorized by the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) 2013 as shown in Table 1:

	Table 1. SMEs Distribution across Nigeria (Table 1. SMEs Distribution across Nigeria (Source: SMEDAN, 2013)				
	CATEGORY	Population	%			
1	Manufacturing	4,887,395	13.21			
2	Wholesale and Retail trade	20,224,627	54.67			
3	Accommodation and Food service Activities	2,039,517	5.51			
4	Mining and Quarrying	70,443	0.19			
5	Construction	731,303	1.98			
6	Water Supply; Sewerage, Waste Management and Remediation	7,875	0.02			
7	Agriculture, Forestry, Fishing and Hunting	3,300,778	8.92			
8	Transport and Storage	1,760,932	4.76			
9	Information and Communication	335,604	0.91			
10	Administrative and Support Services Activities	213,724	0.58			
11	Education	104,420	0.28			
12	Art Entertainment and Recreation	390,609	1.06			
13	Other Services Activities	2,927,351	7.91			
	TOTAL	36,994,578	100			

The convenient sampling technique was adopted. A total of 52 websites cutting across each category based on the level of penetration of that industry/category was selected resulting in the use of 0.00014% of the total population.



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A survey questionnaire populated with closed-ended questions in the form of a checklist was used to gather relevant information. The checklist was derived from the Web Content Accessibility Guideline (WCAG) 2.0 checklist and drawn up by Web Accessibility in Mind (Web AIM).

The Web accessibility evaluation tools were used because it is a form of content analysis protocol. They are software programs and online services that help determine if a website meets accessibility guidelines. There are also tools that help repair accessibility barriers. Some repair functions are built into evaluation tools, and some tools focus only on repair, such as HTML Tidy. Some evaluation tools can be configured to be more useful to a specific project. For example, once the accessibility barriers to be addressed are figured out, the tool can therefore be configured to evaluate those barriers in specific pages. This speeds up the evaluation and simplifies the report (W3C, 2013). Four different tools were used in this article and they include:

- i. Wave Accessibility tool
- ii. Fang add-on for Mozilla Firefox
- iii. Mozilla Firefox Web Browser
- iv. Google Chrome Web browser

A survey questionnaire populated with closed-ended questions in the form of a checklist was used to gather relevant information required to fully answer the research questions generated for this study.

4. Results and Discussion



Figure 1. State Distribution of websites evaluated (SMEDAN, 2013)

Figure 1 shows that almost 60% of the websites as acquired from the Nigerian based enterprise are located in Lagos state making it the most populated state with IT oriented SMEs. Lagos state also has the highest number of SMEs making it the focal point (SMEDAN, 2013).

CATEGORY	%	SAMPLE	APPROX
Manufacturing	13.21	6.605	6
Wholesale and Retail trade	54.67	27.335	26
Accommodation and Food service Activities	5.51	2.755	3
Mining and Quarrying	0.19	0.095	1
Construction	1.98	0.99	1
Water Supply; Sewerage, Waste Management and Remediation	0.02	0.01	1
Agriculture, Forestry, Fishing and Hunting	8.92	4.46	4
Transport and Storage	4.76	2.38	2
Information and Communication	0.91	0.455	1
Administrative and Support Services Activities	0.58	0.29	1
Education	0.28	0.14	1
Art Entertainment and Recreation	1.06	0.53	1
Other Services Activities	7.91	3.955	4
TOTAL	100	50	52

Table 2. Distribution across categories (Source: SMEDAN, 2013)

The distribution by SMEDAN gives thirteen (13) classifications of SMEs in Nigeria as shown in Table 2. It can be seen that the wholesale and retail trade penetrates the most, resulting to 54% of the total population of SMEs in Nigeria.

The checklist implemented for the evaluation process was broken down into seven (7) sections and each section treats a particular aspect of a website. The sections include:

- i. Keyboard
- ii. Headings
- iii. Images
- iv. Links
- v. Forms
- vi. Multimedia
- vii. Text

S/N	Requirement	Yes	Yes	No	No
		Frequency	%	Frequency	%
A1 A2 A3 A4	Is it in logical order? Has focus indicators? Consistent behavior? Is page functionality available using the keyboard?	45 31 28 35	86.5% 59.6% 53.8% 67.3%	7 21 24 17	13.5% 40.4% 46.2% 32.7%
A5	Is it visually apparent in which page element has the current keyboard focus (i.e., As you tab through the page, can see where you are)?	30	57.7%	22	42.3%

Table 3. Keyboard accessibility conformity (Source: WCAG 2.0 checklist, 2017)

Table 3 shows that 86.5% of the evaluated websites are arranged in a logical manner enabling readability by the screen reader. 31 of the total sample of websites conform to the use of focus indicators. A Focus indicator is a faintly drawn box around an object such as a link of an image which enables users tab through the website using the keyboard. This focus indicators may or may not be consistent throughout the web page as only 54% actually allow complete use of the keyboard in accessing objects. Most websites rated well in this section.

Table 4. Headings Accessibility (Source: WCAG 2.0 checklist, 2017)

S/N	Requirement	Yes	Yes	No	No
		Frequency	%	Frequency	%
B1	Follows hierarchy?	33	63.5	19	36.5
B2	Visual indication?	33	63.5	19	36.5
B3	Descriptive page title?	50	96.2	2	3.8

Individuals who are blind or visually impaired can use screen readers as an assistive tool. These screen readers use the HTML tags in interpreting information to the listeners. If the Heading tags, that is <h1> to <h6> are not arranged in ascending order, it becomes difficult for the listener to understand what the outputs. It is fair that in Table 4, 63.5% of the sample population followed a logical heading hierarchy. Same goes for the Page title of the current page. Only 4% of the sample did not have adequate page titles which are usually located in the tab header of the web browser.

Table 5. Images frequency and percentage (Source: WCAG 2.0 checklist, 2017)

	Requirement	Range	0_9	10_19	20_29	30_39	40_49
C1	Number of images with missing Alt text	Frequency	35	12	2	1	2
		Percentage	67.3%	23.1%	3.8%	1.9%	3.8%

All images must have alternate text which is placed in the "**alt**" attribute of the "**img**" tag. This is read out by screen readers to blind users when using assistive technology. Percentages above are relative to



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the number of images per site. Some have few images while others have a lot, mostly the wholesale and retail sites so as to sell products. From Table 5, almost 70% of the evaluated sample have below 10 images requiring alt text. Also, images showing indescribable features such as random patterns and dots require a null text, only six websites contained images in null text.

	Table 6. Link frequency and distribution (Source: WCAG 2.0 checklist, 2017)							
S/N	Requirement	Yes	Yes	No	No			
		Frequency	%	Frequency	%			
D1	Ambiguous link text: Instructions do not rely upon shape, size, or visual location (e.g., "Click the square icon to continue" or "Instructions are in the right-hand column").	4	7.7	48	92.3			
D2	Instructions do not rely upon sound (e.g., "A beeping sound indicates you may continue.").	0	0.0	52	100.0			
D3	Consistency: Navigation links that are repeated on web pages do not change order when navigating through the site.	44	84.6	8	15.4			

In Table 6, the ambiguous link text includes phrases such as: "Click the square icon to continue" or "Instructions are in the right-hand column". Such links prove abortive when being read by a screen reader and visually impaired users who utilize these tool, such that they would find it difficult to locate the said links. From the evaluation of links in Table 6, it was found that only 7.7% of websites made use of such links leaving the remaining 92.3% with easily accessed links. The evaluation also shows that instructions on 100% of the websites do not rely on sounds such as a beeping tone. As a de facto rule, websites opt for the inclusion of 5 basic id attribute to div tags which are the "header", "nav", "banner", "content" and "footer". The navid holds all anchor links to major pages on the website. With this, it is seen that 84.6% of the 52 evaluated sites are consistent in major navigation areas across all pages in the site.

S/N	Requirement	Yes	Yes	No	No	Absent	Absent
		Frequency	%	Frequency	%	Frequency	%
F1	Auto play	9	17.3	3	5.8	40	76.9
F2	Captions; Audio descriptions are	1	1.9	7	13.5	44	84.6
	provided for all video content						
F3	Embedded multimedia is	1	1.9	7	13.5	44	84.6
	identified via accessible text						
F4	Keyboard access	4	7.7	3	5.8	44	84.6
F5	Automatically moving, blinking	12	23.1	5	9.6	40	76.9
	or scrolling contents lasting						
	longer than 5 seconds should be						
	able to be paused, stopped or						
	hidden by the user						
F6	Content should have no time limit	17	32.7	0	0.0	35	67.3

Table 7. Multimedia distribution (Source: WCAG 2.0 checklist, 2017)

Multimedia is the combined use of text, audio, graphics and animation to convey information. Table 7 shows that only one website had an embedded video which was able to cater for functions such as play, pause, mute etc. For other websites, they made use of carrousel feature or slideshow of images along with text and this was considered. 76.9% of the evaluated websites didn't have either a slideshow, video or audio file for conveying information leaving the remaining 23.1% for consideration under this section. Nine (9) websites had their multimedia on auto play this in some cases may be unsuitable for photo sensitive users. Such media should provide options to stop auto play and any other blinking feature, 23% were able to provide options to stop moving and/or blinking media. Captions are often necessary for disabled users and only 1 website was able to provide such. A total of 4 websites that is 7.7% was accessible via the keyboard.

S/N	Requirement	Yes	Yes	No	No
		Frequency	%	Frequency	%
G1	The page is readable and functional when the text size is doubled.	52	100.0	0	0.0
G2	Blocks of text over one sentence in length: Are no more than 80 characters wide.	44	84.6	8	15.4
G3	Are fully justified (aligned to both the left and the right margins).	32	61.5	20	38.5
G4	Have an adequate line spacing (at least 1/2 the height of the text) and paragraph	47	90.4	5	9.6
G5	Do NOT require horizontal scrolling when the text size is doubled	41	78.8	11	21.2
G6	The language of the page is identified using the HTML Lang attribute (<html lang="en">, for example).</html>	42	80.8	10	19.2
G7	Fonts should be in em or % rather than pt or px	36	69.2	16	30.8

Table 8. Text interpretation (Source: WCAG 2.0 checklist, 2017)

When text size is doubled, the content of the websites is 100% readable to users. Table 8 shows that "Blocks of text over one sentence in length which are not more than 80 characters wide" is true for mostly wholesale and retail sites that do not require long text, the remaining 15.4% were mostly sites that required a detailed description of their activities. Using the Wave accessibility tool, this study was able to identify the websites with justified blocks of text. There were 61% accountable for justified text which ensures readability. Only 9.6% of the total sample provided poor line spacing as a result of bad styling (CSS).

5. Conclusion

This study was able to evaluate the level of compliance with basic rules of web accessibility by Small and Medium Scale Enterprises in Nigeria. An attempt was made to check if there is a significant



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effort on the part of business owners in Nigeria to accommodate disabled users by designing for all using various tools along with observations and testing.

The findings show that there is a positive approach by both designers and business owners towards the adoption of accessible websites. Some of these approaches in the researcher's opinion were as a result of the quality of websites and how important its implementation is to the business owner. It is thereby recommended that Web site designers no matter how small a job is, should always keep the users in mind when designing i.e. User centered approach to design.

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