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USABILITY & ACCESSIBILITY EVALUATION FOR WEBSITE QUALITY

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Abstract: Government websites serve as an interactional communication between the user and government. This study aims to present the analysis regarding accessibility of 45 ministry government websites in India. For this purpose, three different automated testing online tools were used to examine the selected websites. The analysis results showed that web-pages of government in India had low levels of compliance according to WCAG 2.1 guidelines. The majority of web-pages did not follow the lowest level of accessibility criteria Level A. In addition, about half of the overall web sites had problems with accessing from mobile devices and about third of the websites had broken-links. Moreover, this study discusses some significant suggestions that may help in resolving the accessibility issues with websites.

Keywords: **Accessibility, Usability, Government website, WCAG**

I. INTRODUCTION

Nowadays for general information government sites are at the top of information sources in the world. Regarding this context, healthcare sites are considered as most important pillars of any governmental information resources [3-4]. According to statistics, the internet users in India-2023 increases by 833 million users with 59.5% penetration rate [1]. E-government means converting government public services into digital web forms and accessing these services from anywhere, anytime through mobile devices, tablets, and computers. Tax declaration, online health records, and applying for licenses are some of the main features of the e-government ecosystem. These resources have taken traditional non-digital practice towards the accomplishment of public service and various types of information's [2]. Government websites provides easy communication and various medical informative services for their customers, treatment process, online payments, access doctor's information, online appointments, and methods for treatment. The COVID-19 pandemic has affected public services all over the World. Impose of lockdown in the country, all services suddenly got shut down and opened online. Due to which, the significance of government websites grew rapidly. Previous studies indicate that well designed, good color contrast, ease to use, color choice, and easy to read websites of government makes a good attraction

to their customers [5]. WHO-2011 report, (World Health Organisation) 15.3% of the global population and 2.21% of the Indian population have some disabilities as per the census 2011 [6]. The United Nations General Assembly adopted Rights of Persons with disabilities. The Convention has eight signatories and 182 countries – including India. This signed agreement covers many areas and sectors such as government, economic, civil, education and internet access [7]. Therefore, to provide ecosystem that is fully accessible to all without any barriers comprises the universality. To achieve the website universality, the content should be accessible to everyone W3C (World Wide Web Consortium) has proposed several guideline and standards, which attempts to create barrier-free websites on the World Wide Web (WWW) via certain design principles and guidelines, for Persons with Disabilities (PwDs).

The W3C provide widely recognized accessibility standards and guidelines (WCAG 1.0, 2.0 and 2.1) for any website. Depending upon these guidelines and standards, it becomes easy to evaluate and analyze how well the websites satisfies the basic need of users. Studies on the quality of web pages have increased greatly in multiple applications like health sector, banks, taxation and education with usage of websites. Various methods such as automated tools and expert assessment are used primarily to conduct the tests on websites, and to evaluate them for site security, usability and accessibility. For this purpose one of the frequently used methods is automatic tool based evaluation since it can supports manual testing and can be easily employed.

Government websites should give every citizen equal right to communicate and access information. Multiple disabilities of people, skills, and educational backgrounds should be considered while developing the accessible government sites. The aim of this study is to examine the government websites of India regarding web accessibility. This study also gathers the service provided to the government website users, and tries to remove the literature gaps. To improve the website quality, this study provides constructive suggestions which may help in removing various issues in existing infrastructure of website.

This paper is structured as follows: the upcoming section consist of literature review. In the section third describes, the methodology used to evaluate government sites. Section fourth consists of evaluation results. Section fifth consists of useful suggestions drawn for improvement of websites. Finally, paper concludes in the sixth section.

II. LITERATURE REVIEW

Previous studies examined the government websites in various developing and developed nations regarding accessibility [9–11]. The previous studies have shown the presence of accessibility problems in various websites across different nations based on guideline WCAG1.0 and 2.0. Some studies have examined the government websites regarding web accessibility in various countries such as Canada, Italy, America, Britain, Spain, Iran, Portugal, India, Africa, France, Brazil, Germany, Taiwan, Netherlands and EU. Majority of these sites did not meet the minimum WCAG conformance levels. Moreover, the previous studies have used either 1.0 or 2.0 WCAG standard to examine accessibility for government sites. However, few studies have also used both WCAG1.0 and 2.0 guidelines [11-15]. However, few similar studies examined similar issues (i.e., accessibility to health-care sites). All these studies show major accessibility issues and low compliance against WCAG accessibility standards.

In the post COVID-19 scenario, all governments around the world have started to deliver their information and services through online medium (e.g., websites). With the escalate growth in online health services, it becomes crucial to offer users an inclusive services. This study describes tools, countries, size and the methods used to analysis the government sites in India regarding web accessibility. Afterwards, we identify various levels of accessibility issues and provide useful practical changes that website designers and developers can make.

III. METHODOLOGY

An accessibility& usability analysis of government web sites in India is provided by the study. In this context, the list of top 45 government ministry websites was obtained from the global and country government ranking [16-17].

3.1 Tools

TAW is online automatic testing tool that analyzes accessibility regarding WCAG2.1 standard. This tool also generates a report to the user as a result of analysis. This online tool is available at https://www.tawdis.net/. This tool is most frequently and successfully used in various studies for accessibility of government web sites. The report of TAW tool consists of detail summary of problems, warnings and not reviewed. Not reviewed consist of various controls, where manual testing is required. The detailed report presented in Figure. 1. Many researchers used TAW tool [11-12, 14-15].

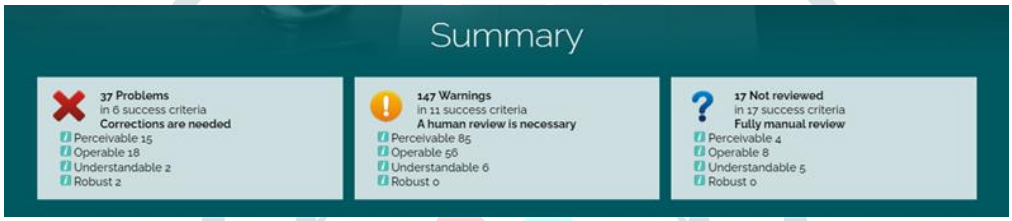

Figure 1: Summary of TAW

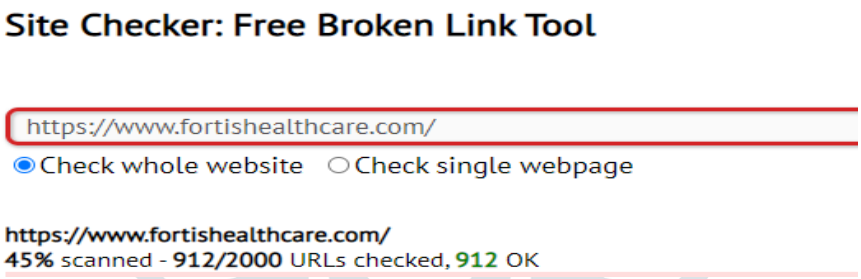

Figure 2: Summary of Scanned URLs checked

Another major parameter affecting website accessibility is mobile usability. Google's Mobile-friendliness tool was used for this purpose to evaluate web-page response on compatible mobile device. Interface of tool Mobile-friendly shown in figure.3 with test report.

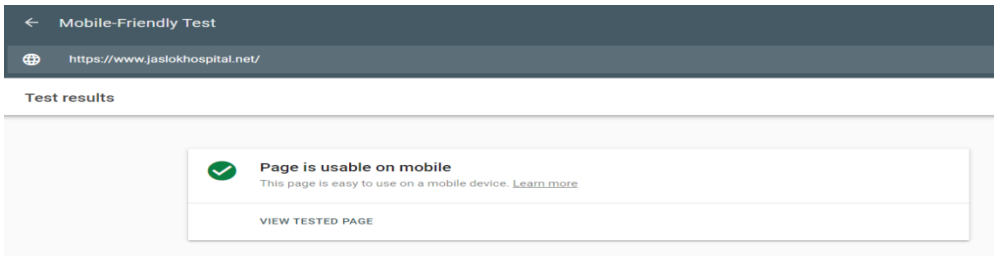

Figure 3: Report of Mobile Friendly Test

IV. RESULTS

4.1 Accessibility Analysis

This section presents the results of government websites analyzed using TAW tool. The identified problems did not meet the basic level A conformance requirements. The list of problems on behalf of 4 principles POUR, namely perceivable, operable, understandable, and robust, is presented in figure. 4.

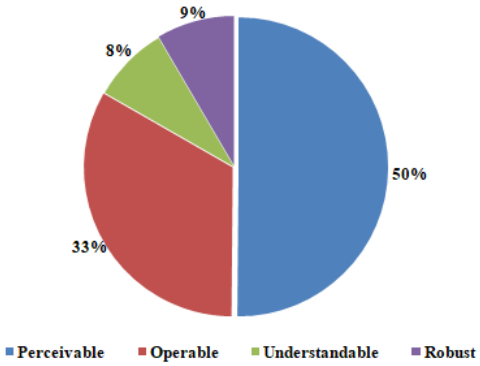

Figure 4: Accessibility issues according to POUR principles

The outcomes of the results show that the principles with majority of issues were perceivable (50%) and operable (33%). The principle understandable had lowest rate of error with 8%.

The overall accessibility report shows the clear evidence of violations based on both Levels A and AAA of WCAG2.1 guidelines. The higher count of accessibility problems for basic Level A of WCAG 2.1 in the Indian government web-pages indicates that majority of the web sites do not follow the minimum accessibility requirement. However, none of the sites had errors regarding level AA accessibility. The most repeatedly violated issues were 1.1.1--Non-text-Content and 2.4.4—Link-Purpose only for Level A, which were violated by all sites. These issues were followed by 1.3.1—Info and Relationships, 4.1.2—Name, Role, value. The least violated success criteria was 2.2.2—Pause-Stop-Hide and success criteria 2.4.10 – Section Headings was violated by a single website.

4.2 Usability Analysis

Dead Link analysis: In this analysis, Indian government sites were examined with online test tool Deadlink Checker. This tool checks the number of dead links or broken-links. About 62% sites have no broken links, 7% of sites have less than five, and 31% have greater than five broken-links. Figure 5 shows the analysis results of overall count of broken-link test. The highest count of broken-links among all governments site was 58. The investigated statistics uncovers that 38% of government websites having broken link issues.

Broken Links	None	<5	>5	Average URLs checked	Min	Avg	Max
Number of websites (*n*= 45)	34	02	09	306.62	0	7.27	58

Figure 5: Broken link analysis

Mobile- Usable analysis: In this analysis, online test tool “Mobile-friendly Test” designed by Google was used for evaluation for mobile usability. The evaluation result shows that majority of government web-pages pass the mobile-usability test. Usability test results of the 45 government web-pages are presented. Test result report shows that (52%) websites pass the test and (48%) websites fails in the test.

Overall, according to results it proves that mobile usability is given very low priority in government web-pages in India.

V. SUGGESTIONS

Government websites plays a significant role in providing mandatory information to various users. Based on the present evaluated results, the given below critical points should be considered while designing and developing various government websites.

1. For all non-text content for the web, text alternatives should be provided
2. Headers should be provided for each page, table, and section.
3. Any kind of information conveyed in the form of colors and symbols is also available in text.
4. Body color and text color contrast mechanisms should be there in default browsers.
5. Text images, text, captions and should be resized up to 200percent, and text should be wrapped around the line to line so that text should be vertically and horizontally scrolled through.
6. The purpose of each input field checkboxes, radio buttons, text fields, and drop-down menus should be appropriately identified.

VI. CONCLUSION & DISCUSSION

Government websites in India were examined in this study in terms of accessibility. Online accessibility tools were used in this analysis. For accessibility errors TAW tool, for usability of mobile devices a mobile-friendly test by Google, and for broken-links Dead-link checker tool, were used in this analysis. The results declared that majority of issues were related to basic level A, according to WCAG2.1 standard. This study also examined the total number of broken-links present in government web-pages in India. Broken-links are a web-page reference that redirects user to a particular "page not found" webpage which may overcome user's willingness to further redirect the web-page. The findings declare that 62% sites had no broken-links and 38% websites had five or more broken links. However, we still recommend that website developers, broken-link issues should be properly defined using valid links of web-pages and timely check webpage's in order to provide equal access to all users. Finally, the web-pages were examined in terms of mobile-friendliness. The result clearly indicates that the government website visitors may experience the issues regarding accessibility. This study presented the accessibility evaluation results of government sites in India. According to the previous literature studies, no published study found which utilized new standards provided by WCAG2.1 to evaluate accessibility of government web-pages. The future work could extend the accessibility study of government websites, further different parameters can be extended for accessibility under all levels of WCAG2.1 standards.

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