

Web Accessibility of Palestinian Universities: Can We Access Higher Education Information during COVID-19?

Iyad Abu Doush¹, Mohammed A. Awadallah² and Mohammed Azmi Al-Betar^{3,4}

¹Computing Department, American University of Kuwait, Salmiya, Kuwait

²Department of Computer Science, Al-Aqsa University, P.O. Box 4051, Gaza, Palestine

³Department of Information Technology - MSAI, College of Engineering and Information Technology, Ajman University, Ajman, U.A.E.

⁴Department of Information Technology, Al-Huson University College, Al-Balqa Applied University, Al-Huson, Irbid, Jordan

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Abstract: University web portals are considered one of the main access gateways for universities. Accessibility of university online services is a major issue for undergraduate and graduate students with disabilities. Online registration makes people with disabilities more independent to register courses, add, drop courses, or attend courses independently. Yet, many people with disabilities in Palestine face major challenges when using university websites. In order to understand the issues that face people with disabilities when they use websites of Palestinian universities, this study evaluates the accessibility of the home pages of these universities during COVID-19. In order to evaluate partially the accessibility of Palestinian universities during COVID-19, we apply automatic evaluation on all homepages of eighteen Palestinian universities. The most violated guideline is *empty link* which is related to success criterion 2.4.4 *Link Purpose*. The second highest violated error is *linked image missing alternative text* which is related to the success criterion 1.1.1 *Non-text Content*. The obtained results show that all the universities websites are not conforming to Web Content Accessibility Guidelines (WCAG) 2.0 level A.

1 INTRODUCTION

According to the world health organization (WHO), 15% of the world population lives with some form of disability. People with disabilities attend universities to improve their skills and this can assist them to enter the job market and be financially independent (Fichten et al., 2003). One of the obstacles that encounter students with disabilities is the inability to access the web site of the university because it does not conform to the accessibility standards (Ali et al., 2019). The university student can use the university website to apply for the university, read information, access the registration, search the library, and access the online learning system. Therefore, it is very crucial for people with disabilities to access all the information provided by the university website (Ali et al., 2019).

Web accessibility means providing the content on the web for all the people and that the content can be

accessed by automatic tools including assistive technologies used by people with disabilities (Abu-Doush et al., 2013). The ultimate purpose is to have an inclusive web which can be accessed by all people along with people with disabilities (Paris, 2006).

In 2008 the United Nations Convention on the Rights of Disabled Persons established a law that encourages governments to guarantee the accessibility of physical environment and technologies. This was used by several countries to update their laws to have a commitment to ensure the accessibility of technology and the physical environment.

The World Wide Web Consortium (W3C) is an international organization that places specifications and rules for the web. The Web Contents Accessibility Guidelines (WCAG) (wca,) are certain rules provided by W3C which can be used by web developers to ensure the accessibility of websites by all people including people with disabilities. These guidelines provided by W3C are called.

This paper evaluates partially the accessibility of the homepage of eighteen Palestinian universities using two automatic tools. The evaluation results can help in highlighting the commonly violated WCAG 2.0 in Palestinian universities. This can help in raising the awareness of implementing these guidelines in Palestinian universities and in higher education in general.

The rest of the paper is structured as follows: The background is presented in Section 2. The methodology is described in Section 3. Section 4 provide the results and discussions. Finally, the conclusion and some future directions are drawn in Section 5.

2 BACKGROUND

The web accessibility evaluation can be conducted normally using experts' reviews, automatic tools, and user testing (Doush and AlMeraj, 2019).

Much research work has been conducted to evaluate the accessibility of web sites that provide different services for users. In this section, we will present some relevant research that investigated the web accessibility of universities websites.

Ismail and Kuppusamy (Ismail and Kuppusamy, 2018) conducted a study to evaluate the accessibility of Indian universities website homepages. Two automatic tools (AChecker and WAVE) are used for evaluating the homepages of 302 Indian universities. The WCAG 2.0 guidelines are used. The study outcome points out that 73% of homepages are either medium or high accessibility. Another study by the same authors (Ismail and Kuppusamy, 2019) evaluate the web accessibility of college websites that are affiliated with the University of Kashmir and Cluster University Srinagar. The study used two automatic evaluation tools web accessibility test (TAW) and the accessibility engine powering browser extensions (aXe). Both tools indicate many violations of the success criteria of WCAG.

Some researchers provide recommendations to enhance universities' website accessibility. For example, Hackett and Parmanto (Hackett and Parmanto, 2005) report that not providing alternative text for images and image map hotspots is the most violated WCAG success criteria.

Some studies investigate the web accessibility status in universities in some Middle Eastern countries. A study investigated the web accessibility of universities in Saudia Arabia for the period 2009 and 2017 (Akram and Sulaiman, 2017). The study outcome shows that none of the universities conform to WCAG 2.0. In another Study, 15 web developers and

web researchers from 9 Saudi universities interviewed to identify the challenges to conform to WCAG 2.0 (Alayed et al., 2016). The main challenges discovered are not involving people with disabilities in web development, unavailability of clear instructions for university website accessibility, and insufficient web accessibility training for developers.

Providing accessible physical environments and technologies for people with disabilities is crucial in higher education. Alsalem and Abu Doush (Alsalem and Doush, 2018) investigated how accessible are the physical environments and technologies in the universities and colleges in Jordan for students with disabilities. Questionnaires are used to poll staff of computer laboratories and libraries in addition to web developers and e-learning staff. The study results show the lack of assistive technologies in computer labs and libraries. Also, two experts evaluated the universities websites and found that there is no agreement with WCAG 2.0.

A limited number of studies explore the accessibility of other e-services provided by universities. Emad et al. (Ali et al., 2019) evaluated the online registration system in two of the largest universities in Jordan. Visually impaired students performed different tasks to register the classes online. The results of the study show that the visually impaired students were not able to complete many of the tasks because the online registration website does not conform with WCAG 2.0. The first main barrier for most students was that the screen reader reads only numbers in the table boxes and other boxes on the web page without mentioning what are these numbers represent (i.e., "Meaningful sequence"). This is because tables are not presented in the correct sequence. The second main barrier is the high number of needed tabs, more than 20 tabs are needed by the users, and no 'skip to content' link is provided.

Kurt (Kurt, 2017) performs a longitude study to evaluate the improvement of web accessibility in Turkish universities over the period 2010 to 2015. The outcome of the study shows that in general, the accessibility levels have decreased slightly. The most violated criteria are missing text alternative for non-text content.

Hammad et al. (Hammad et al., 2020) investigated the usability and accessibility of eleven e-learning portals from eleven countries using three automatic tools. The used tools are EvalAccess for web accessibility evaluation, Linkchecker to check the usability of the website, and Pingdom to check the website performance based on the load time and the page size. The study outcome shows that all the tested e-learning portals do not conform to the WCAG 2.0.

Ismailova and Inal (Ismailova and Inal, 2018) evaluated the web accessibility of the top universities in Kyrgyzstan, Kazakhstan, Azerbaijan, and Turkey using automated assessment tools. The majority of the university websites in the study did not meet the WCAG 2.0 accessibility criteria. Only two Kyrgyz and two Kazakh university websites attained conformance level A. The study outcome point out the importance of improving the accessibility of these websites.

Kamal et al. (Kamal et al., 2016) evaluate web accessibility for 36 Jordanian universities and educational institutes using seven automatic tools. The results show a weakness in applying the WCAG on all the tested websites.

Hassouna et al. (Hassouna et al., 2017) investigated in 2017 the web accessibility problems on 15 Palestinian university websites using WCAG guidelines to design accessible web page prototype. The opinion of 16 blind users' is polled using an online questionnaire to identify the features of the prototype. The developed prototype is then validated by the blind user's. The evaluation shows that the developed prototype is highly accessible (mean score 4.19).

3 METHODOLOGY

All the Palestinian universities listed in the ministry of higher education website¹ are evaluated in this study as shown in Table 1. The homepage of the website is tested as it is the first door to enter all other pages and services of the website.

Table 1: The abbreviations of the studied universities.

| Abb. | University | Homepage |
|------|----------------------------------|-------------------------------------------------------------------------------------|
| AAU | Arab American University | https://www.aaup.edu/ |
| ANU | An-Najah National University | https://www.najah.edu/ar/ |
| AQU | Al-Aqsa University | https://www.alaqsa.edu.ps/ar/home/ |
| AZU | Al-Azher University | http://www.alazhar.edu.ps/ |
| BU | Bethlehem University | https://www.bethlehem.edu/ |
| BZU | Birzeit University | http://www.birzeit.edu/ |
| GU | Gaza University | http://www.gu.edu.ps/ |
| HU | Hebron University | https://www.hebron.edu/ |
| IU | Israa University | https://ar.israa.edu.ps/ |
| IUG | The Islamic University of Gaza | http://www.iugaza.edu.ps/ |
| PPU | Palestine Polytechnic University | https://www.ppu.edu/pl/ar |
| PTU | Palestine Technical University | https://ptuk.edu.ps/ |
| QOU | Al-Quds Open University | https://www.qou.edu/ |
| QU | Al-Quds University | https://www.alquds.edu/ar/ |
| UP | University of Palestine | https://up.edu.ps/ar/ |

The web accessibility of these websites is evaluated using two automatic tools. We use two evaluation tools as different tools can capture different vi-

¹<http://www.mohe.pna.ps/Higher-Education/Institutions/Universities>

olations. We selected the top two automatic evaluation tools in terms of the correctly identified problems according to (Abduganiev, 2017) which are EIII Checker² and WAVE³. Both tools check the website conformance against WCAG 2.0 Level A success criteria. The EIII Checker tool provides an accessibility score of the evaluated website based on the number of problems on the website.

WAVE evaluation tool returns the following summary about the tested web page Errors, contrast errors, alerts, features, structural elements, and ARIA. As we are interested in WCAG we present only these errors.

Also, we tested the mobile-friendliness of university Web sites using Google mobile-friendly test⁴. Note that we use only automatic tools which is considered a partial check of web accessibility because of the need of expert evaluation or user evaluation to obtain all the accessibility issues that cannot be detected by automatic tools (Doush and AlMeraj, 2019).

4 EXPERIMENTAL RESULTS

The results from the WAVE tool show that the universities with the largest number of errors are ANU and AAU with 60 and 50 errors respectively. The universities with the smallest number of errors are AZU and PTU with 11 errors for both of them. The most violated guideline is *empty link* which happened 158 times. This violation is related to success criterion **2.4.4 Link Purpose**. The second highest violated error is *linked image missing alternative text* with 101 times, which is the success criterion **1.1.1 Non-text Content**.

The results from EIII Checker show that the universities PTU and ANU have the largest number of errors with 80 and 62 errors respectively. On the other hand, the universities AZU and UP have the smallest number of errors with 23 and 25 errors respectively. The universities with the highest accessibility score are QOU and AZU with the rank first and second. This matches partially the result of the number of errors as AZU had the smallest number of errors. While UP had also the second smallest number of errors with 25 errors, but QOU ranked second in accessibility score with 33 errors.

The most violated guideline is *use HTML form controls and links* with 163 errors. This is the success criterion **4.1.2 Name, Role, Value**. The next violated

²<http://checkers.eiii.eu/>

³<https://wave.webaim.org/>

⁴<https://search.google.com/test/mobile-friendly>

Table 2: Wave.

| # | Error | AAU | ANU | AQU | AZU | BU | BZU | GU | HU | IU | IUG | PPU | PTU | QOU | QU | UP | Total |
|----|---------------------------------------|-----|-----|-----|-----|----|-----|----|----|----|-----|-----|-----|-----|----|----|-------|
| 1 | Missing alternative text | 10 | 10 | 9 | 1 | 5 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 14 | 6 | 10 | 57 |
| 2 | Missing form label | 1 | 4 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 31 |
| 3 | Multiple form labels | 4 | 6 | 1 | 4 | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 14 | 2 | 1 | 14 |
| 4 | Empty button | 13 | 16 | 18 | 4 | 2 | 7 | 20 | 3 | 9 | 11 | 12 | 11 | 14 | 10 | 8 | 158 |
| 5 | Empty link | 4 | 4 | 2 | 2 | 10 | 1 | 10 | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 21 | 21 |
| 6 | Empty heading | 14 | 14 | 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | Broken ARIA reference | 14 | 14 | 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | Broken ARIA menu | 14 | 14 | 14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | Linked image missing alternative text | 18 | 20 | 9 | 4 | 3 | 8 | 10 | 14 | 14 | 10 | 14 | 14 | 13 | 2 | 2 | 101 |
| 10 | Document language missing | 50 | 60 | 36 | 11 | 39 | 41 | 41 | 14 | 10 | 24 | 27 | 11 | 32 | 31 | 22 | 1 |
| 11 | Total | 18 | 46 | 62 | 47 | 30 | 47 | 31 | 35 | 42 | 30 | 80 | 33 | 28 | 25 | 25 | 1 |

Table 3: EIII Checker.

| # | Error | AAU | ANU | AQU | AZU | BU | BZU | GU | HU | IU | IUG | PPU | PTU | QOU | QU | UP | Total |
|-------------|--------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | Accessible name for image links | 18 | 6 | 9 | 4 | 4 | 9 | 2 | 2 | 23 | 9 | 13 | 8 | 14 | 4 | 12 | 100 |
| 2 | Use alt on ing elements | 1 | 16 | 4 | 4 | 9 | 1 | 8 | 8 | 11 | 8 | 2 | 2 | 2 | 2 | 2 | 96 |
| 3 | Language of Parts | 4 | 4 | 1 | 1 | 14 | 1 | 2 | 2 | 3 | 1 | 1 | 1 | 4 | 2 | 1 | 14 |
| 4 | Provide descriptive labels | 1 | 4 | 1 | 2 | 2 | 1 | 12 | 1 | 1 | 1 | 1 | 68 | 4 | 2 | 23 | 108 |
| 5 | Provide descriptive headings | 3 | 3 | 3 | 6 | 15 | 8 | 1 | 1 | 10 | 9 | 5 | 11 | 14 | 8 | 8 | 163 |
| 6 | Define ids for elements | 17 | 21 | 19 | 4 | 2 | 11 | 18 | 6 | 10 | 2 | 2 | 11 | 14 | 2 | 2 | 16 |
| 7 | Use HTML form controls and links | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |
| 8 | Title attribute to identify controls | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 9 | Use a button to identify the purpose of a form control | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 10 | Submit forms without submit buttons | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 11 | Use the title for frame and iframe elements | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 12 | Use of pointing-device-specific only event handlers | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 13 | Primary language of page | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 14 | Label groups of form elements | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total | | 46 | 62 | 40 | 23 | 47 | 30 | 47 | 31 | 35 | 42 | 30 | 80 | 33 | 28 | 25 | 1 |
| Score (100) | | 86.66 | 90.53 | 87.75 | 92.57 | 75.96 | 88.05 | 80.51 | 76.95 | 93.72 | 78.39 | 83.48 | 92.03 | 95.47 | 87.69 | 76.68 | |

Table 4: Results of the Google mobile-friendly test.

| University | Mobile friendly |
|------------|-----------------|
| AAU | P |
| ANU | P |
| AQU | F |
| AZU | F |
| BU | F |
| BZU | P |
| GU | P |
| HU | F |
| IU | P |
| IUG | P |
| PPU | P |
| PTU | P |
| QOU | P |
| QU | P |
| UP | P |

guideline is *define ids for elements* with 108 errors which is the success criterion **4.1.1 Parsing**. The third most violated guideline is *accessible name for image links* with 100 errors which is the success criterion **4.1.2 Name, Role, Value**. The provided explanation is based on the EIII Checker tool test demonstration⁵.

The findings suggest an urgent need to improve the accessibility of the Palestinian universities websites. They reveal that a large number of homepages are inaccessible. Violations of the WCAG 2.0 success criteria include non-text content, link purpose (in context), and name, role, value.

Table 4 presents the evaluation results of Google mobile-friendly test. Four out of fifteen university sites homepages pass the test. This shows that 27% of the universities home pages have some accessibility problems for mobile device users.

5 CONCLUSION

In this study, we evaluate the accessibility of eighteen Palestinian universities against WCAG 2.0 level A during COVID-19. The study uses two of the top-recommended automatic tools by the state-of-the-art to evaluate the web accessibility of home pages of these universities.

The overall results show that most of the evaluated Palestinian universities websites lack accessibility. Unfortunately, none of the universities homepages were conformance to the WCAG 2.0 level A. The commonly failed accessibility success criteria are "1.1.1 non-text content", "2.4.4 link purpose" and "4.1.2 name, role, value".

⁵<http://checkers.eiii.eu/en/tests/>

There is a need to further develop appropriate policies and laws and set a national-level plan to enforce the adoption of the national accessibility guidelines and WCAG standards for better inclusion of all citizens when they use higher education.

In the future, we can involve users with disabilities in the testing and we can use task-based evaluation by asking users to do common tasks that is done by students in higher education.

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