Journal of Accessibility and Design for All

Volume 8, Issue 2. (CC) JACCES, 2018. ISSN: 2013-7087

MONITORING FOR ACCESSIBILITY IN MEDICAL UNIVERSITY WEBSITES: MEETING THE NEEDS OF PEOPLE WITH DISABILITIES

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Received: 2017-10-16 | Accepted: 2018-09-08 | Published: 2018-11-30

***Abstract*:** Currently, students consider the Internet as an efficient tool and technology and the Websites of universities play a significant role in their daily activities. Due to the increasing number of students with a disability, accessibility of these Websites is essential. Thus, in the current study, the Websites of medical universities of Iran were investigated to identify accessibility issues if any exists. The homepage of Websites of the medical universities of Iran was evaluated using the AChecker and FAE tools. Moreover, the web pages of each university were evaluated by FAE. To examine the differences in accessibility issues rate among three types of medical universities, Kruskal–Wallis test was performed. The results showed that all three types of universities have accessibility issues. Amongst 50 university websites, only 2 out of them did not display any accessibility problem based on Achecker tool. The score of FAE tool showed that the websites of all Iranian universities of medical sciences are in the NI-R category, which indicates that the accessibility has not been considered in

Rahmatizadeh, S., & Valizadeh-Haghi, S. (2018). Monitoring for accessibility in medical university websites: meeting the needs of people with disabilities. *Journal of Accessibility and Design for All*, *8*(2), 102-124. doi: http://dx.doi.org/10.17411/jacces.v8i2.150

the design of those websites. Moreover, according to Spearman's correlation test, there was a significant inverse correlation between the score of homepage and the number of known problems (P-value= 0.043). Furthermore, there was a significant correlation between the homepage score and score of other pages (P-value <0.001). The accessibility of medical universities' Websites is not in an optimal situation, which severely affects the achievement of universities' visions and missions concerning expanding medical education and improving educational equity. Therefore, it is necessary to make fundamental modifications in this respect. To do so, university, as well as web developers should pay special consideration to accessibility guidelines to make their Websites more accessible.

Keywords: Accessibility; Access to Information; Academic Medical Centers; Disabled Persons; User-Computer Interface; Internet/standards.

Introduction

Currently, the Internet has become a part of everyday life (Bargh & McKenna, 2004). The realisation of high quality and easy communication has been one of the positive effects of the Internet on people's everyday life. The Internet has made it possible to do a lot of activities, such as access to banking services, from home and with far less effort and difficulty (Tyler, 2002). Websites are considered a key component to the survival of an organisation such as a university in today's competitive world (Ahmet Mentes & Aykut Turan, 2012). The use of websites has quickly become an essential part of the academic life. Universities and institutions of higher education use Websites to transfer their distinctive, high-quality aims to students (Anctil, 2008; Saichaie, Morphew, Hartley, Hanson, & Steinke, 2014). Websites are the primary communication channel to do web-based assignments, access information and promotional activities (Bairamzadeh & Bolhari, 2010).

Students tend to use the Internet as an efficient tool and technology (Peng, Tsai, & Wu, 2006) and so university Websites play a very significant role in their daily life as well as in student admission processes in higher education institutions (Saichaie et al., 2014). University Websites often include scientific resources, information, news and organisational policy. Moreover, access to other services of a university such as course selection and the library is provided through the University Website (Kane, Shulman, Shockley, Ladner, et al., 2007). Generally, universities have large and complex Websites that include a subset of Websites related to different parts of the university such as registration, colleges and different departments(Hasan, 2012). Determining the parameters of a well-designed Website is not easy to do because the complex nature of the Websites depends on users' expectations (Lee & Koubek, 2010). So, Website designers should consider many parameters including accessibility, quality, information security and other parameters (Cocquebert, Trentesaux, & Tahon, 2010). The accessibility of a Website plays a significant role in responding to users' needs and expectations.

The tendency toward using the internet is increasing among people with disabilities (Harrison, Barlow, & Williams, 2007) who are prevented from active participation in educational opportunities by various inaccessibility problems (Parry & Brainard, 2010). The disability may be sensorial (such as hearing and vision), emotional and mental. For each of these cases, there are special assistive tools to help people browse web pages. These tools are a combination of software and hardware such as screen readers, voice recognition and Braille displays (Paciello & G., 2000). Since people with disabilities benefit from such tools for effective access to the internet (Harper & Yesilada, 2008), the accessibility of a website plays a major role in fulfilling the users' needs and expectations (McMullan, 2006). A Website designed to be flexible enough to be compatible with all these tools is called an accessible Website (Slatin & Rush, 2003).

Those with disability are only able to use web pages that are compatible with the assistive technologies. Website designers are hence required to

meet website users' needs by considering accessibility during the design process (Cebi, 2013; Cocquebert et al., 2010). According to the available literature, the current issues with web accessibility need to be thoroughly evaluated. In fact, while the designers of a large number of university websites have failed to provide equal accessibility for all groups of users (Bradbard & Peters, 2010; Bradbard, Peters, & Caneva, 2010), higher education institutions are firmly recommended to have their websites designed by professionals who can provide all groups of users, including the disabled individuals (e.g. students), with equal accessibility (Solovieva & Bock, 2014).

Regarding the growing role of university Websites, their accessibility is essential for those with a disability. The number of students with disability is increasing; in 2008, 11% of students in the US were in this group (Scott, 2009). Therefore, accessibility of university Websites has become more important. Since faced with non-accessible university Websites, students with disabilities cannot have access to needed information and so their participation in university activities will be reduced. Furthermore, this issue will affect social justice and equal access to education (Kane, Shulman, Shockley, Ladner, et al., 2007). Therefore, university Websites' administrators are required to identify the problems associated with the accessibility of these Websites. This can identify the Websites' weaknesses and the areas, which need improvement, so an usable Website is provided for all users. To understand the accessibility barriers of university Websites, web accessibility evaluation is needed. Web accessibility evaluation is performed to determine how well the web can be accessed by disabled individuals (Harper & Yesilada, 2008).

Previous studies on university website accessibility

Various studies have discussed the accessibility of higher education institution websites. In this regard, Kurt (2011) evaluated the homepage accessibility of 10 Turkish university websites. Multiple techniques were applied to review the sample of homepages according to the standards of

Worldwide Web Consortium. Based on the results, all homepages had some accessibility problems (Kurt, 2011). In addition, Fernández et al. in 2010 studied the accessibility of 77 Spanish university websites. The results showed that the websites were not accessible; in fact, only 0.9% of web pages were accessible (Fernández, Roig, & Soler, 2010).

Moreover, Da Silva and Alturas (2015) evaluated Portuguese higher education institution websites in terms of accessibility maturity level according to the European Commission standards. Based on the findings, the accessibility maturity level of Portuguese institution websites was low on average; however, there was a great potential to improve the accessibility of websites (da Silva & Alturas, 2015).

Also, Aziz et al. (2010) used EvalAccess 2.0 to evaluate the accessibility of 120 websites of higher education institutions in Malaysia. The findings indicated several accessibility issues (Aziz, Wan Mohd Isa, & Nordin, 2010).

In a previous study, Kane et al. evaluated the accessibility of 100 homepages of top international universities and examined their compliance. According to the results, accessibility problems were found in many top universities, and there were major variations in accessibility among universities from different countries(Kane, Shulman, Shockley, & Ladner, 2007). In another study, web accessibility of Jordanian universities was evaluated, and multiple shortcomings were observed in most websites. Variations in accessibility standards were also found when evaluating the websites by different tools (Kamal & Alsmadi, 2016).

Another study examined the websites of Cyprus higher education institutions. As the findings indicated, no institution could pass all tests without error, and all websites failed one or more of WCAG 2.0 guidelines. Accordingly, modifications were considered necessary to meet the accessibility criteria (Işeri, Uyar, & Ilhan, 2017).

In another study, homepage accessibility of 51 websites, attributed to special education departments, was examined using Achecker and Bobby

software. These tools were used to determine if the websites met the minimum requirements; the number of accessibility errors in each website was measured using one of these tools. Based on the findings, most homepages (97%) had accessibility problems (Ringlaben, Bray, & Packard, 2014).

In a developing country such as Iran with its focus on digital technologies, accessibility gets further importance to achieve inclusive service delivery. Numerous universities are currently using information technology to develop and enhance medical education (Ward, Gordon, Field, & Lehmann, 2001). In Iran, the Deputy for Education of Ministry of Health and Medical Education pays extra attention to promoting equity in higher medical education. It is hence focusing on various issues including equal access to online E-learning services. Therefore, in order for the Ministry of Health and Medical Education to reach its goal of equity in education, university websites and online services should be equally accessible by all people including those with disabilities.

Considering the importance of university website accessibility and lack of research on the accessibility of Iranian medical university websites, this study aimed to evaluate Iranian medical university websites and raise the web developers' awareness regarding the accessibility of these websites for disabled people.

Methodology

Sample

To conduct this descriptive - cross-sectional study, first, the list of Governmental Universities of Medical Sciences was identified (50 universities) through the Website of Ministry of Health of Iran("Medical Universities in Iran," n.d.). Deputy Ministry for Education of the Ministry of Health of Iran has ranked and categorised the medical universities of Iran

into three types (1,2,3) based on their educational and research output. The type 1 universities are the best in the country.

Measures

The accessibility evaluation of websites can be performed manually by experts or by applying automatic tools. Automatic tools provide web designers with cost-effective measures to evaluate the accessibility of various websites (Barricelli, Sciarelli, Valtolina, & Rizzi, 2017; Ivory, Hearst, Ivory, & Hearst, 2001)) through methods not requiring human interventions. Automatic evaluation tools can help designers quickly identify potential accessibility issues. They can provide fully-automated checks and help designers with manual review. These tools can be frequently applied to large numbers of web pages (Harper & Yesilada, 2008). One of the automatic online tools for accessibility evaluation is AChecker, which was developed in 2010 by Greg Gay and Cindy Qi Li (Gay & Li, 2010). AChecker is a reliable tool for assessing the accessibility of websites and has been used to examine the accessibility status of websites in several studies (AkgÜL & Vatansever, 2016; Alahmadi & Drew, 2016; Youngblood, 2014). Also, it has been accredited by the World Wide Web Consortium and introduced in the consortium portal (W3C, 2016). It ("AChecker : IDI Accessibility Checker:," n.d.) processes three levels of problems: likely problems, known problems, and potential problems. Known problems refer to issues previously identified as definite barriers to accessibility. These problems should be resolved by appropriate modifications in web pages. Likely problems are those perceived as probable barriers. Finally, potential problems are issues unidentifiable by AChecker. Human decisions are required for both likely and potential problems (Gay & Li, 2010).

Functional Accessibility Evaluator (FAE), introduced by the University of Illinois, is another automatic tool and open source software, used to evaluate the accessibility of a website or web page according to the W3C Web Content Accessibility Guidelines (WCAG) 2.0 (level A and AA). For every category, FAE presents scores ranging from 0% to 100% and reports a

qualitative status code considering the percentage of passed tests for each website: not applicable; not implemented (0-50% of tests passed); partially implemented (50-94% of tests passed); almost complete (95-99% of tests passed); and complete (100% of tests passed) (Table 1). Generally, FAE is a reliable tool, which has been used in several studies to examine the accessibility status of websites (Ahn & Hwang, 2010; Kane, Shulman, Shockley, & Ladner, 2007).

In this study, the homepages of medical universities were evaluated on May 2018 using the AChecker and Functional Accessibility Evaluator (FAE) automated accessibility testing tools based on WCAG. Moreover, 25 web pages of all selected universities were also analysed using the Functional Accessibility Evaluator.

Procedure

This study first evaluated the percentage of medical university websites, which conform to accessibility standards, i.e. Web Content Accessibility Guidelines (WCAG) 2.0, and would pass automated web accessibility tests. It then sought to identify the differences between the accessibility issues detected in the currently available types of medical university websites.

The number of accessibility errors of homepages of selected universities was determined by AChecker tool using WCAG 2.0 guideline (level AA). To measure the accessibility scores of homepages, as well as 25 of the web pages of each of the 50 selected universities, FAE tool was applied. In order to assess the web pages, the evaluation level was set to (level two).

Moreover, to examine the differences in accessibility issues rate among three types of medical universities, Kruskal–Wallis test was performed. Statistical analysis carried out using SPSS software.

Volume 8, Issue 2. (CC) JACCES, 2018. ISSN: 2013-7087

Results

The number of accessibility problems for three types of universities are presented in Table 2-4. The websites of Mashhad University of Medical Sciences and Birjand University of Medical Sciences did not respond to Achecker and FAE tools, respectively.

Table 1. FAE implementation score definitions.*

Abbrev	Score	Status	Description
C	100	Complete	This means all rules have passed.
R	0	Required Manual Checks	Manual checks are required to determine if accessibility requirements have been met.
AC	95-99	Almost Complete	Almost Complete means that you seem to understand the accessibility requirements of the rules and are close to fully implementing their requirements on all pages within the website.
PI PI-R	50-94	Partial Implementation	Partial Implementation means that you may understand at least some of the accessibility requirements. "-R" means there are required Manual Checks.
NI NI-R	0-50	Not Implemented	Incomplete means that you do not understand the accessibility requirements of the rules or did not consider accessibility in the design of the website. "-R" means there are required Manual Checks.
na	-	Not Applicable	No markup was found that identified a known or possible accessibility issue

*Adapted from FAE official website ("Functional Accessibility Evaluator," 2018)

All three types of universities showed accessibility issues (Tables 2-4). The highest number of known problems was reported in Urmia University of Medical Sciences (n= 1060), while the lowest number was attributed to Tabriz University of Medical Sciences (n= 0) and Kurdistan University of Medical Sciences (n= 0). Also, the highest homepage score was attributed to Guilan University of Medical Sciences (n= 42), while the lowest score was related to Shahid Sadoughi University of Yazd (n= 0). In addition, assessment of 25 pages of websites showed that the highest score was related to Torbat-e-Heydarieh University (n= 39), while the lowest score was reported in Shahid Sadoughi University of Yazd (n= 0).

Table 2. The accessibility problems and score for type 1 universities.

Universities (URL)	Homepage					Webpages D=2, pages=25	
	Achecker			FAE		FAE	
	KP[a]	LP[b]	PP[c]	Score	Status	Score	Status
Shiraz University of Medical Sciences	991	7	843	20	NI-R	27	NI-R
Ahvaz Jundishapur University of Medical Sciences	354	0	703	26	NI-R	27	NI-R
Mashhad University of Medical Sciences	-	-	-	26	NI-R	29	NI-R
Iran University of Medical Sciences	57	0	701	10	NI-R	14	NI-R
Tabriz University of Medical Sciences	0	0	0	31	NI-R	31	NI-R
Tehran University of Medical Sciences	76	0	1023	30	NI-R	31	NI-R
Shahid Beheshti University of Medical Sciences	63	9	780	38	NI-R	36	NI-R
Isfahan University of Medical Sciences	42	1	706	26	NI-R	28	NI-R

Universities (URL)	Homepage					Webpages D=2, pages=25	
	Achecker			FAE		FAE	
	KP[a]	LP[b]	PP[c]	Score	Status	Score	Status
Kerman University of Medical Sciences	13	0	601	17	NI-R	22	NI-R

[a]KP= Known Problems; [b]LP= Likely problems; [c]PP= potential problems

Table 3. The accessibility problems and score for type 2 universities

Universities (URL)	Homepage					Webpages D=2, pages=25	
	Achecker			FAE		FAE	
	KP	LP	PP	Score	Status	Score	Status
Urmia University of Medical Sciences	1060	9	1195	11	NI-R	11	NI-R
Baqiyatallah University of Medical Sciences	882	8	1615	16	NI-R	19	NI-R
Lorestan University of Medical Sciences	379	0	931	5	NI-R	9	NI-R
Semnan University of Medical Sciences	394	0	876	9	NI-R	10	NI-R
Babol University of Medical Sciences	18	18	755	34	NI-R	32	NI-R
Kashan University of Medical Sciences	225	0	1363	14	NI-R	14	NI-R
Zanjan University of Medical Sciences	162	1	600	11	NI-R	12	NI-R
Guilan University of Medical Sciences	158	9	839	42	NI-R	34	NI-R
Ardabil University of Medical Sciences	100	4	646	33	NI-R	35	NI-R
Shahed university	106	0	739	17	NI-R	23	NI-R

Universities (URL)	Homepage					Webpages D=2, pages=25	
	Achecker			FAE		FAE	
	KP	LP	PP	Score	Status	Score	Status
Arak University of Medical Sciences	84	0	1201	5	NI-R	11	NI-R
Zahedan University of Medical Sciences	85	1	651	30	NI-R	35	NI-R
Qazvin University of Medical Sciences	71	1	1206	9	NI-R	17	NI-R
University of Social Welfare and Rehabilitation Sciences	23	6	770	36	NI-R	34	NI-R
Hormozgan University of Medical Sciences	28	0	428	30	NI-R	32	NI-R
Hamadan University of Medical Sciences	15	0	151	14	NI-R	16	NI-R
Mazandaran University of Medical Sciences	13	5	880	11	NI-R	23	NI-R
Birjand University of Medical Sciences	9	5	1791	-	-	-	-
Kermanshah University of Medical Sciences	15	9	798	30	NI-R	32	NI-R
Golestan University of Medical Sciences	299	0	1549	24	NI-R	22	NI-R
Shahid Sadoughi University of Medical Sciences	2	0	7	0	R	0	R
Rafsanjan University of Medical Sciences	2	0	226	10	NI-R	9	NI-R

Table 4. The accessibility problems and score for type 3 universities

Universities (URL)	Homepage					Webpages D=2, pages=25	
	Achecker			FAE		FAE	
	KP	LP	PP	Score	Status	Score	Status
Alborz University of Medical Sciences	657	0	957	5	NI-R	15	NI-R
Bushehr University of Medical Sciences	237	1	1038	32	NI-R	33	NI-R
Sabzevar University of Medical Sciences	57	0	705	31	NI-R	26	NI-R
Bam University of Medical Sciences	255	0	3311	11	NI-R	10	NI-R
AJA University of Medical Sciences	182	0	904	17	NI-R	20	NI-R
Jahrom University of Medical Sciences	154	0	625	25	NI-R	28	NI-R
Shahroud University of Medical Sciences	112	12	696	33	NI-R	35	NI-R
Dezful University of Medical Sciences	65	0	289	11	NI-R	7	NI-R
Qom University of Medical Sciences	47	0	764	16	NI-R	13	NI-R
Shahrekord University of Medical Sciences	63	0	731	26	NI-R	30	NI-R
Zabol University of Medical Sciences	35	12	490	34	NI-R	35	NI-R
Yasuj University of Medical Sciences	500	4	959	20	NI-R	22	NI-R
Gonabad University of Medical Sciences	360	0	449	13	NI-R	19	NI-R
Ilam University of Medical Sciences	11	5	657	31	NI-R	31	NI-R
North Khorasan University of Medical Sciences	55	6	697	26	NI-R	26	NI-R
Fasa University of Medical Sciences	3	12	485	35	NI-R	33	NI-R
Torbat Heydarieh University of Medical Sciences	77	2	465	33	NI-R	39	NI-R

Universities (URL)	Homepage					Webpages D=2, pages=25	
	Achecker			FAE		FAE	
	KP	LP	PP	Score	Status	Score	Status
Kurdistan University of Medical Sciences	0	0	0	30	NI-R	33	NI-R
Jiroft University of Medical Sciences	837	8	1025	11	NI-R	10	NI-R

The mean of accessibility known problems for all Websites was 192.51±268.765. Furthermore, the mean of known problems of Websites for type 1 universities was 199.50±338.889, followed by 187.73±281.088 for type 2 university and 195.11±236.068 for type 3 universities (Table 5).

Based on the Kruskal-Wallis test, the mean number of known problems, likely problems, and potential problems was not significantly different among different types of medical universities of Iran (Table 5). Moreover, the mean scores of homepages and 25 web pages of university websites were not significantly different among three types of medical universities of Iran, based on the Kruskal-Wallis test (Table 5).

Table 5 Average accessibility problems and score based on university type

		Type1 Mean (SD)	Type2 Mean (SD)	Type3 Mean (SD)	Total Mean (SD)	P-value
AChecker	KP	199.50 (338.89)	187.73 (281.09)	195.11 (236.07)	192.51 (268.77)	0.798
	LP	2.13 (3.68)	3.45 (4.75)	3.26 (4.57)	3.16 (4.46)	0.751
	PP	669.63 (298.48)	873.5 (464.37)	464.37 (662.17)	812.67 (526.22)	0.372
FAE Homepage		24.89 (8.27)	18.62 (12.07)	23.16 (9.70)	21.53 (10.69)	0.238
FAE D=2, pages<=25		27.22 (6.24)	20.48 (10.77)	24.47 (9.84)	23.27 (9.90)	0.340

Volume 8, Issue 2. (CC) JACCES, 2018. ISSN: 2013-7087

According to Spearman's correlation test, there was a significant inverse correlation between the score of homepage and number of known problems (r= -0.293, N= 49, P-value= 0.043); in other words, lower scores were associated with more errors. Also, there was a significant correlation between the homepage score and score of 25 web pages (r= 0.929, N= 49, P-value <0.001); in other words, the higher homepage score is associated with the higher score of other pages.

Discussion

The internet has the potential to affect educational systems fundamentally in the next future. Thus, universities are faced with concerns about providing the applicants with better online access to needed information. While non-educational services also are offered by medical universities (. e.g. healthcare services), the users of these Websites include wide range of the community and therefore it is necessary to take fundamental measures to address accessibility issues.

To our knowledge, this study is the first step toward assessing the accessibility status of medical universities.

There are special tools and guidelines that can help web developers to make Websites more accessible. Nevertheless, unfortunately, the present study showed that medical university websites of Iran are not accessible enough. Lazar et al. in a study entitled “Web accessibility in the Mid-Atlantic United States: a study of 50 homepages” revealed that 98% of studied Websites present accessibility issues(Lazar, Beere, Greenidge, & Nagappa, 2003). Similarly, many studies conducted on university Websites have revealed that they also have severe accessibility problems(Comeaux & Schmetzke, 2007; Espadinha, Pereira, da Silva, & Lopes, 2011; Kamal & Alsmadi, 2016).

The results of the current study showed that the accessibility of most websites of Iranian medical universities is not suitable and needs to be addressed in order to resolve accessibility problems.

No statistically significant differences were found between the known accessibility problems and the types of medical universities ($p>0.05$).

Type 1 universities were expected to have a superior status, whereas the opposite was discovered (Table 5). This can be attributed probably to more complexity(Hackett, Parmanto, & Zeng, 2005) for type 1 universities Websites. Although it is expected that accessibility issues should not be ignored while increasing complexity of design, content, and images on Websites. This shortcoming gradually makes it difficult for universities to fascinate applicants with the desired characteristics(Veloutsou, Lewis, & Paton, 2004).

In this study, scores of homepages assessment showed a significant relationship with the scores of reviewed web pages (25 web pages). Moreover, there was a significant inverse correlation between the score of homepage and number of known problems; in other words, lower scores were associated with more errors. Therefore, it can be concluded that the homepage is a proper representative of the entire website; in fact, if the homepage of a website has accessibility problems, other web pages of that are likely to have similar problems. It is clear that other kind of websites should be evaluated to find out if the same relationship exists or not. Nevertheless, regarding that, there was a very strong relationship ($r= 0.929$, $N= 49$, P-value <0.001) between accessibility score of the homepage and score of 25 web pages of each website, thus, it seems that our study results can be generalised to other types of websites too.

The score of FAE showed that the websites of all Iranian universities of medical sciences are in the NI-R category, which indicates the designers' misunderstandings about the accessibility needs of websites. Therefore, designers of Iranian medical university websites should evaluate the accessibility of those websites and take requred actions to solve any related problems. It should be kept in mind that online tools should be merely used as assistive tools to inform website designers about the accessibility status of websites.

Regarding the results, various reasons are considered as possible causes; Some researches have shown that one of the main problems is that many web developers do not see accessibility as a priority(Erickson, Trerise, VanLooy, Lee, & Bruyère, 2009; Lazar, Dudley-Sponaugle, & Greenidge, 2004). The other reason is some Websites are created in limited time and or restricted budget which these restrictions prevent the use of the professional Website designers (Erickson et al., 2009; Steinau, Díaz, Rodríguez, & Ibáñez, 2003). Even some of them are unaware of the importance of the Website for the success of the university(Erickson et al., 2009). In a study on web accessibility policies and practices of about 700 community colleges (a 79% response rate) in the US, nearly half of the respondents regarded all three types of barriers as issues for their campus (Erickson et al., 2009).

Disabled people are considered as a part of universities different groups of applicants. Regarding that university Web sites has an essential role in motivating international student choice of the host country. Thus, the accessibility barriers may lead to lose the university potential national and international applicants with disability. Disabled staffs are also another group of university website users challenged by accessibility issues. Since Iranian medical universities are responsible for a wide range of health services, the disabled community in the country, as a whole, can be regarded as a group of medical university website users. These people will all have to deal with accessibility issues when using university websites.

Conclusion

The results of assessing the accessibility of Iranian medical universities' Websites revealed that their accessibility was not in suitable condition. This will strongly affect the achievement of universities' visions and missions regarding medical education expansion and improving educational equity.

Currently, paying attention to the issue of accessibility of Websites is very important. The findings of this study showed that even websites that were

not identified by Achecker were categorised in the NI-R category by FAE and should be reviewed by specialists. Therefore, the use of one single online tool for determining the accessibility of websites is not adequate, and it is preferable to apply more than one instrument. Although automated tools seem adequate for obtaining general knowledge about accessibility issues, more detailed information cannot be collected without a combination of automated tools and manual testing by a group of professionals (e.g. web developers, webmasters, and content managers).

Considering the growing significance of websites in the provision of relevant information to different stakeholders, Iranian medical universities should ensure the accessibility of their websites by all users including the disabled. Thus, the university, as well as web developers, should pay special consideration to accessibility guidelines to make their Websites more accessible. Therefore, universities need to hire skilled information technology experts and website designers to develop websites which are equally accessible by current and future students with normal conditions or disabilities. Accessibility tests should also be performed to ensure the satisfaction of accessibility needs and prevent future accessibility issues.

The present study has been done on May 2018. At the time of the present study, WCAG 2.0 was the latest accessibility criteria guideline. The current recommendation of WCAG is 2.1, which is published at 5th June of 2018. This change may affect our findings by detecting more accessibility issues, as WCAG2.1 extends WCAG2.0 by integrating new success criteria, supporting definitions, and guidelines for organising the additions, along with some additions to the conformance section. However, WCAG2.1 uses the same conformance model as WCAG2.0; therefore, websites that conform to WCAG2.1 also conform to WCAG2.0 guidelines. Nevertheless, it is recommended to carry out future studies based on WCAG2.1 to better understand accessibility issues. Furthermore, web developers are suggested to adopt WCAG2.1 as a new conformance target to improve the accessibility of websites.

Limitations

Since this study was limited to Iranian medical universities, its results cannot be generalised to other types of universities or organisations. Nevertheless, the results can provide web developers and organisations concerned about website accessibility with valuable information. Additionally, websites are dynamic and constantly being updated or reconstructed; all of which may change the results found in this study.

Acknowledgments

This article is extracted from the research project (code 15924) which is funded by the School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences.

References

[1] AChecker : IDI Accessibility Checker. (n.d.). Retrieved May 29, 2017, from http://www.atutor.ca/achecker/

[2] Ahmet Mentes, A. S., & Aykut Turan, A. H. (2012). Assessing the Usability of University Websites: An Empirical Study on Namik Kemal University. *The Turkish Online Journal of Educational Technology*, *11*(3).

[3] Ahn, M. L., & Hwang, Y. J. (2010). How Accessible is EDUNET Contents? *International Journal for Educational Media and Technology*, *4*(1), 79–87.

[4] Akgul, Y., & Vatansever, K. (2016). Web Accessibility Evaluation of Government Websites for People with Disabilities in Turkey. *Journal of Advanced Management Science*, 201–210.

[5] Alahmadi, T., & Drew, S. (2016). An evaluation of the accessibility of top-ranking university websites: Accessibility rates from 2005 to 2015. *There and back: Charting flexible pathways in open, mobile and istance education* (pp. 224–233).

[6] Anctil, E. (2008). *Selling higher education: Marketing and advertising America's colleges and universities*. Jossey-Bass Inc Pub.

[7] Aziz, M. A., Wan Mohd Isa, W. A. R., & Nordin, N. (2010). Assessing the accessibility and usability of Malaysia higher education website. *Proceedings - 2010 International Conference on User Science and Engineering, i-USEr 2010* (pp. 203–208).

[8] Bairamzadeh, S., & Bolhari, A. (2010). Investigating factors affecting students' satisfaction of university websites. *2010 3rd International Conference on Computer Science and Information Technology* (pp. 469–473). IEEE.

[9] Bargh, J. A., & McKenna, K. Y. A. (2004). The Internet and Social Life. *Annual Review of Psychology*, *55*(1), 573–590. Annual Reviews.

[10] Barricelli, B. R., Sciarelli, P., Valtolina, S., & Rizzi, A. (2017). Web accessibility legislation in Italy: a survey 10 years after the Stanca Act. *Universal Access in the Information Society*, 1–12. Springer Berlin Heidelberg.

[11] Bradbard, D. A., & Peters, C. (2010). Web Accessibility Theory and Practice : An Introduction for University Faculty. *Journal of Educators Online*, *7*(1), 1–47.

[12] Bradbard, D. A., Peters, C., & Caneva, Y. (2010). Web accessibility policies at land-grant universities. *The Internet and Higher Education*, *13*(4), 258–266.

[13] Cebi, S. (2013). Determining importance degrees of website design parameters based on interactions and types of websites. *Decision Support Systems*, *54*(2), 1030–1043.

[14] Cocquebert, E., Trentesaux, D., & Tahon, C. (2010). WISDOM: A website design method based on reusing design and software solutions. *Information and Software Technology*, *52*(12), 1272–1285.

[15] Comeaux, D., & Schmetzke, A. (2007). Web accessibility trends in university libraries and library schools. (A. Schmetzke, Ed.)*Library Hi Tech*, *25*(4), 457–477. Emerald Group Publishing Limited.

[16] Erickson, W., Trerise, S., VanLooy, S., Lee, C., & Bruyère, S. (2009). Web Accessibility Policies and Practices at American Community Colleges. *Community College Journal of Research and Practice*, *33*(5), 403–414. Taylor & Francis Group .

[17] Espadinha, C., Pereira, L. M., da Silva, F. M., & Lopes, J. B. (2011). Accessibility of Portuguese Public Universities' sites. *Disability and Rehabilitation*, *33*(6), 475–485. Taylor & Francis.

[18] Fernández, J. M., Roig, J., & Soler, V. (2010). Web accessibility on spanish universities. *Proceedings - 2nd International Conference on Evolving Internet, Internet 2010, 1st International Conference on Access Networks, Services and Technologies* (pp. 215–219).

[19] Functional Accessibility Evaluator. (2018). *University of Illinois*. Retrieved May 20, 2018, from https://fae.disability.illinois.edu/pages/162056af1ec4dc3c/rc/all/page/1/

[20] Gay, G., & Li, C. Q. (2010). AChecker: open, interactive, customizable, web accessibility checking. *Proceedings of the 2010 International Cross Disciplinary Conference on Web Accessibility (W4A) - W4A '10* (p. 1). New York, New York, USA: ACM Press.

[21] Hackett, S., Parmanto, B., & Zeng, X. (2005). A retrospective look at website accessibility over time. *Behaviour & Information Technology*, *24*(6), 407–417. Taylor & Francis Ltd.

[22] Harper, S., & Yesilada, Y. (2008). *Web accessibility: a foundation for research*. (S. Harper & Y. Yesilada, Eds.). Springer Science & Business Media.

[23] Harrison, S., Barlow, J., & Williams, G. (2007). The content and interactivity of health support group websites. *Health Education Journal*, *66*(4), 371–381.

[24] Hasan, L. (2012). Evaluating the usability of nine Jordanian university websites. *2012 International Conference on Communications and Information Technology (ICCIT)* (pp. 91–96). IEEE.

[25] Işeri, E. I., Uyar, K., & Ilhan, Ü. (2017). The accessibility of Cyprus Islands' Higher Education Institution Websites. *Procedia Computer Science* (Vol. 120, pp. 967–974).

[26] Ivory, M. Y., Hearst, M. A., Ivory, M. Y., & Hearst, M. A. (2001). The state of the art in automating usability evaluation of user interfaces. *ACM Computing Surveys*, *33*(4), 470–516. ACM.

[27] Kamal, I. W., & Alsmadi, I. M. (2016). Evaluating Web Accessibility Metrics for Jordanian Universities. *International Journal of Advanced Computer Science and Applications*, *7*(7), 113–122.

[28] Kane, S. K., Shulman, J. A., Shockley, T. J., & Ladner, R. E. (2007). A web accessibility report card for top international university web sites. *Proceedings of the 2007 international cross-disciplinary conference on Web accessibility (W4A) - W4A '07*, 148–156.

[29] Kane, S. K., Shulman, J. A., Shockley, T. J., Ladner, R. E., Kane, S. K., Shulman, J. A., Shockley, T. J., et al. (2007). A web accessibility report card for top international university web sites. *Proceedings of the 2007*

international cross-disciplinary conference on Web accessibility (W4A) - W4A '07 (p. 148). New York, New York, USA: ACM Press.

[30] Kurt, S. (2011). The accessibility of university web sites: The case of Turkish universities. *Universal Access in the Information Society*, *10*(1), 101–110.

[31] Lazar, J., Beere, P., Greenidge, K.-D., & Nagappa, Y. (2003). Web accessibility in the Mid-Atlantic United States: a study of 50 homepages. *Universal Access in the Information Society*, *2*(4), 331–341. Springer-Verlag.

[32] Lazar, J., Dudley-Sponaugle, A., & Greenidge, K.-D. (2004). Improving web accessibility: a study of webmaster perceptions. *Computers in Human Behavior*, *20*(2), 269–288.

[33] Lee, S., & Koubek, R. J. (2010). The effects of usability and web design attributes on user preference for e-commerce web sites. *Computers in Industry*, *61*(4), 329–341.

[34] McMullan, M. (2006). Patients using the Internet to obtain health information: How this affects the patient–health professional relationship. *Patient Education and Counseling*, *63*(1–2), 24–28.

[35] Medical Universities in Iran. (n.d.). . Retrieved May 29, 2013, from http://dme.behdasht.gov.ir/uploads/Iranmed_Uuniversity.htm

[36] Paciello, M. G., & G., M. (2000). *Web accessibility for people with disabilities*. CMP Books.

[37] Parry, M., & Brainard, J. (2010). Colleges lock out blind students online. *Chronicle of Higher Education*.

[38] Peng, H., Tsai, C., & Wu, Y. (2006). University students' self-efficacy and their attitudes toward the Internet: the role of students' perceptions of the Internet. *Educational Studies*, *32*(1), 73–86. Routledge.

[39] Ringlaben, R., Bray, M., & Packard, A. (2014). Accessibility of American University Special Education Departments' Web sites. *Universal Access in the Information Society*, *13*(2), 249–254.

[40] Saichaie, K., Morphew, C. C., Hartley, M., Hanson, J. M., & Steinke, I. (2014). What College and University Websites Reveal About the Purposes of Higher Education. *The Journal of Higher Education*, *85*(4), 499–530. Cambridge University Press.

[41] Scott, G. A. (2009). *Higher Education and Disability: Education Needs a Coordinated Approach to Improve Its Assistance to Schools in Supporting Students*.

[42] da Silva, P., & Alturas, B. (2015). Web accessibility: Study of maturity level of Portuguese institutions of higher education. *2015 10th Iberian Conference on Information Systems and Technologies (CISTI)* (pp. 1–7).

[43] Slatin, J. M., & Rush, S. (2003). *Maximum accessibility : making your Web site more usable for everyone*. Addison-Wesley.

[44] Solovieva, T. I., & Bock, J. M. (2014). Monitoring for Accessibility and University Websites: Meeting the Needs of People with Disabilities. *Journal of Postsecondary Education and Disability*, *27*(2), 113–127.

[45] Steinau, S., Díaz, O., Rodríguez, J. J., & Ibáñez, F. (2003). Enterprise Information Systems IV. In M. Piattini, J. Filipe, & J. Braz (Eds.), (pp. 227–234). Hingham, MA, USA: Kluwer Academic Publishers.

[46] Tyler, T. R. (2002). Is the Internet Changing Social Life? It Seems the More Things Change, the More They Stay the Same. *Journal of Social Issues*, *58*(1), 195–205. Blackwell Publishers Inc.

[47] Veloutsou, C., Lewis, J. W., & Paton, R. A. (2004). University selection: information requirements and importance. *International Journal of Educational Management*, *18*(3), 160–171. Emerald Group Publishing Limited.

[48] Web Accessibility Evaluation Tools List. (n.d.). . Retrieved May 29, 2017, from https://www.w3.org/WAI/ER/tools/

[49] Ward, J. P., Gordon, J., Field, M. J., & Lehmann, H. P. (2001). Communication and information technology in medical education. *The Lancet*, *357*(9258), 792–796.

[50] Youngblood, N. E. (2014). Revisiting Alabama state website accessibility. *Government Information Quarterly*, *31*(3), 476–487.

Journal of Accessibility and Design for All

Volume 8, Issue 2. (CC) JACCES, 2018. ISSN: 2013-7087

Rahmatizadeh, S., & Valizadeh-Haghi, S. (2018). Monitoring for accessibility in medical university websites: meeting the needs of people with disabilities. *Journal of Accessibility and Design for All, 8*(2), 102-124. doi: http://dx.doi.org/10.17411/jacces.v8i2.150