

## **Access Education: What is Needed to Have Accessible Higher Education for Students with Disabilities in Jordan?**

**Gheed Mufied Alsalem,  
Counseling and Special Education Department, The University of Jordan,  
Amman 11942,  
Jordan**

**Iyad Abu Doush,  
Computer Science Department,  
Yarmouk University, Irbid 21163,  
Jordan  
Computer Sciences and Information Systems,  
American University of Kuwait,  
Salmiya,  
Kuwait  
(idoush@auk.edu.kw)**

### **Abstract**

*The number of students with disabilities attending universities is increased, and several challenges face them in higher education institutions. This study aims to determine accessibility needs of computer laboratories, libraries and websites for students with disabilities at Jordanian universities and colleges. The sample consists of staff in computer laboratories and libraries, web developers and e-learning staff to identify environmental and technological barriers from their perspective, as well as, to check their knowledge about assistive technology (AT) and issues related to accessibility. Questionnaires and expert review methods are used to test accessibility of websites in the investigated universities and colleges. Results indicated that current status of accessibility does not meet the expectations of equal access nor the needs of students with disabilities where there is shortages of ATs in computer labs and libraries, lack of awareness and insufficient training for the universities' staff and web developers related to accessibility issues, and all the evaluated universities web sites are inaccessible. Implications that should be contemplated by policy makers are highlighted and other recommendations are explored.*

**Keywords:** Environmental barriers; Technological barriers; Web accessibility; Accessibility of universities services; Laboratories and libraries accessibility evaluation

### **Introduction**

Completing a university or a college degree is important for students with disabilities (Fichten, Asuncion, Barile, Généreux, Fossey, Judd, Robillard, De Simone, & Wells, 2001). In their literature review, Fullarton and Duquette (2016) cited several reasons that encourage students with disabilities to finish their postsecondary studies. That is; “to achieve a personal goal, prove their worth, meet family and peer expectations, ...enhance success in the workplace, and obtain financial security employment can bring” (p. 55). Consequently, there is an increasing number of them enrolled in postsecondary/ higher education institutions these days (Getzel, 2008; Heiman, Fichten, Olenik-Shemesh, Keshet, & Jorgensen, 2017). However, challenges faces students with disabilities is increased when attending higher education institutions (Webster, 2004). A person with disability may face three types of barriers: environmental, attitudinal, and technical. *Environmental barriers* are barriers that environmentally limit persons with disabilities from accessing and using public facilities. *Attitudinal barrier* means discriminating a person with disability through people's attitude, ideas, and assumptions (e.g., assuming a person with communication disorder cannot understand you). *Electronic or technical barrier* happened when a technology cannot be reformed into another format accessible by assistive devices (Whiteneck, Harrison-Felix, Mellick, Brooks, Charlifue, & Gerhart, 2004). Even though law enforce eliminating such barriers, some universities are physically inaccessible (Gilson, 2010), programmatically (Gilson, Dymond, Chadsey, & Hsu, 2007), and/or attitudinally (Gilson & Dymond, 2011). For example, in their study, Gilson and Dymond (2012) investigated barriers encountered by people with disabilities in Hong Kong University and investigate the effect of these barriers. The study evaluated different departments' services, student-instructor interaction, and environmental implication. Results revealed several barriers encounter students with disabilities when enrolling the university within these aspects.

In 2006, The United Nations Convention on the Rights of Disabled Persons established a commitment from the governments to give people with disabilities equal rights to access different facilities provided to the society. In Jordan, the Jordanian government amended the legislation twice; in 2007 and 2017 on the Rights of Persons with Disabilities (No. 31/2007) and (No. 20/ 2017) respectively, that was enacted in 1993 for the Welfare of Disabled People (No. 12/1993). Such law will allow people with disabilities to have equal opportunities in the society. The law indicated that one of the main responsibilities of the Ministry of Higher Education (MHE) and its educational institutions is “to provide reasonable accommodation arrangements, facilitating format, and accessibility to ensure that persons with disabilities are included in the available specialization” (No. 20/2017, Article 21-2). Thus, people with disabilities need to have an opportunity to fully participate in all aspects of activities at a university or a college inside and outside classrooms which allow them to participate effectively as students (Sach & Schreuer, 2011). This implies an ability to access information in classrooms and to access electronic resources through higher education institutions' websites. In addition, to access on-campus facilities including computer laboratories and libraries.

For people with disabilities, to access physical and social environment depends on the availability and use of AT (Carlson & Ehrlich, 2005). As well, for many of them to use computers and access electronic materials, they need adaptations that includes both hardware and software (Fichten, Asuncion, Robillard, Fossey, & Barile, 2003). This applies to accessing online information through web pages via assistive technologies to help individuals with disabilities (Hackett & Parmanto, 2005). Despite the above, Al-Hmouz (2014) identify obstacles in the higher education system facing students with disabilities in one public Jordanian university. The study point-out that students with disabilities do not have all necessary resources which help them meet their study needs. In addition, assistive devices are not available and most of the students with disabilities indicate that inadequate learning and assessment accommodations are provided to them.

In order for programs and activities in colleges and universities to be fully accessible to students with disabilities, colleges and universities are “specifically required to make reasonable modifications in their practices, policies and procedures, and to provide auxiliary aids and services for persons with disabilities” (“Rights of Students with Disabilities in Higher Education”, 2013, p. 10). This is indicated under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act, and implies the usability of buildings, as well as, learning materials and online environments by people with disabilities (Parks, n.d.). Gibson (2006) mention that the best location for adaptive technology is often in a room in a library or be a part of computer labs or in an independent building. According to Burgstahler (2012a, 2012b), using features and principles of universal design when preparing computer labs and libraries will make the need for special accommodation in the minimum level. Also, everyone feels welcome and comfortable to communicate, to move around, to access both printed and electronic materials and sources, and to use different hardware and software.

This paper preliminary investigated accessibility of computer laboratories, libraries, and websites to students with disabilities in Jordanian universities and colleges. The study surveyed awareness and preparation of workers in computer labs and library for accessible technologies and investigate on site the environmental barriers, as well as, awareness and preparation of web developer and e-learning staff for general and technical web accessibility guidelines. It explore related barriers in these settings from participants’ perspectives. Finally, it checked accessibility of websites in these institutions.

For relevant work to this study that was reviewed, results of a recent research indicate quite low levels of services of library patrons, human resources, public relations, information sources, tools and equipment and new technologies, and library building for people with visual disability in Jordan in light of international standards (Al-Zboon & Hadidi, 2013). In accordance to Ekwelem (2013), findings of the study shows that most of students with visual impairment and mobility challenge in 9 federal and state universities in south-east Nigeria perceived “that libraries were established to serve only non-disabled users and that there is inadequate knowledge of the need of those who do not or cannot use the library” (p. 3). According to Fichten et al. (2003), participants of study 1 were 156 Canadian postsecondary personnel responsible for providing services to students with disabilities, and they represent 91 community/junior colleges and 55 universities.

Generally, results of their investigation show that participants' knowledge about adaptive computer technologies were limited.

In this context, accessibility to higher education would be incomplete without considering related websites accessibility. According to Henry (2006), having accessible web provides people with disabilities with unprecedented opportunities to both access information and interaction. Web accessibility has been a concern in many research studies. Relevant research studies investigate different topics such as: methods to be conducted to evaluate web accessibility (Hackett & Parmanto, 2005; Hackett & Parmanto, 2009; Henry & Grossnickle, 2004; Ivory & Hearst, 2001; Thompson, Burgstahler, & Comden, 2003; Yesilada, Brajnik, & Harper, 2009), web usability challenges (Abuaddous, Jail, & Basir, 2016; Curran, Walters, & Robinson, 2007; Lazar, Allen, Kleinman & Malarkey, 2007; Menzi-Cetin, Alemdag, Tuzun, & Yıldız, 2017), features are needed to be included in the web contents in order to consider them accessible (Becker, 2004; Carter, 2004, Chisholm, Vanderheiden, & Jacobs, 2001; Hanson, 2001), ways to improve web usability for elderly people and people with disabilities (Johnson & Kent, 2007), evaluating accessibility of important institutions' websites in different sectors (Goette, Collier, & White, 2006; Hackett & Parmanto, 2005, Hong, Katerattankul, & Joo, 2008; Ismail & Kuppusamy, 2018; Jennifer & Cowley, 2005; Kuzma, Dorothy, & Oestreicher, 2009; Thompson et al., 2003) and awareness of web developers with accessibility related issues (Freire, Russo, & Fortes, 2008).

### **Significance of the study**

In order to determine what is needed to have accessible higher education for students with disabilities, we need to know what we actually have. The primary aim of the study is to provide information about the accessibility of libraries, computer labs, as well as, web developer and e-learning staff's awareness of accessibility barriers. These information will be a base for recommendations to be considered by decision makers when set up policies and critical decisions to be implemented. It is a way to provide better, more quality, and accessible services for students with disabilities.

Focusing on improving the accessibility of computer labs and libraries is important. Heaven's (2004) stated that "library and information services lie at the heart of learning at every higher education institution and have both moral and legal obligations to ensure equitable access to both the building and its resources for all users" (p. 24). Furthermore, Whitaker's (n.d.) report mentioned that computer labs are a critical resource that nearly every student need to have access to at some point during college. In addition, many courses of different programs in Jordanian higher education institutions perform computerized exams where students should be available on a certain time in a computer lab to be able to have the online test.

Websites accessibility indulge more importance due to "the increase of online instructional materials [that] presents new opportunities -and possible barriers- for accessibility in higher education" (Lewis, Yoder, Riley, So, & Yusufali, 2007). In line with this context, here in Jordan, initiatives to blend online approach to education have been started in several higher education institutions. So, it is time to check how accessible our higher education institutions are for people with disabilities.

Gathering data for a part of this study was through computer labs and libraries' staff who are in administrative positions and who are directly in contact with students in these facilities. For students with disabilities, it is important to interact with library staff who have knowledge and awareness of the needs of different kinds of disabilities to support them (Heaven, 2004). In his turn, Carter (2004) indicated the need and importance for students with disabilities to interact with library staff who are sensitive and understanding to their needs and who are aware of accessible information, services, and available equipment which would insure equitable access. Rationally, this is applied for computer lab staff, too. For the other part of the study, data was gathered from web developer and e-learning staff as their awareness and preparation for web accessibility guidelines is one of the main challenges cited in the literature to develop accessible web sites (Abuaddous et al., 2016).

## **Methods**

### **Participants and Settings**

To understand the accessibility of computer laboratories, libraries, and websites for students with disabilities in Jordanian universities and colleges, this study took place at five higher educational institutions: Al Albayt University, The Hashemite University, Alzarqa University, Almafraaq College, and Cortoba College. These five Jordanian universities and colleges were selected to be in areas of Jordan outside the capital, Amman, and to cover the case of accessibility in other cities.

A total of 31 subjects participated in the study from these institutions. They were distributed into three categories. Two of these categories (Twenty-four) were personnel responsible for providing services to students in computer labs and libraries whereas eighteen (7 females and 11 males) were computer labs staff, and six (4 females and 2 males) were library staff. The third category composed of 6 participants (1 female and 5 males) and they were web developers and e-learning staff.

### **Instrumentation, Implementation and Data Analysis**

Three sets of questionnaires were developed to collect information from the three categories of participants. These questionnaires composed of several parts: one part was to collect demographic information, other parts were to evaluate environmental and technological barriers, respectively, in computer labs and libraries. Another part of the questionnaires was used to evaluate the staff awareness and technical skills in computer labs and libraries of accessible environment and AT needed by students with disabilities in these settings.

Items of these parts were mostly Yes/ No questions and addressed the kind of services and the common tasks or requirements needed by students with disabilities in these settings. These items were borrowed from related literature (Burgstahler 2012; Doush, 2010; Doush, Mohammed, Ali, & Al-Betar, 2013; Hilton-Chalfen, Neville, Griesel, & Cooper, 1993; Kann, 1999; Leung, Owens, Lamb, Smith, Shaw, & Hauff, 1999; Miller & Sammons, 1999; Whiteneck, Harrison-Felix, Mellick, Brooks, Charlifue, & Gerhart, 2004).

For the set of questionnaires targeted to web developers' there was a part about their awareness of and/or preparation for implementing the web accessibility guidelines. This is based on the Web Content Accessibility Guidelines (WCAG) 2.0 level A and a set of rules extracted from section 508 of the Rehabilitation Act. Section 508 is a legislation regarding equal accessibility to electronic and information technology for people with disabilities (Government-wide Section 508 Accessibility Program, n.d.).

Open-ended questions were included in the part about participants' awareness and their technical skills of accessibility related to students with disabilities. These were in order to highlight actual services that are provided by their institutions as they perceived them, as well as, to list related hindrances from their perspectives which might represent a need for a considerable change and focused insights towards accessible higher education.

For the implementation process, onsite visits were done during the summer semester of the academic year of 2015/2016 for the five participated higher educational institutions to collect the data of this study. This helped taking a close look at services provided for students with disabilities in these institutions. Questionnaires were handed to the participants who signed consent forms that provided brief information of the importance of the study and its purposes. After responding; these questionnaires were directly collected.

For websites of these institutions, homepages were evaluated by an expert through responding to a checklist addressed several basic items of web accessibility barriers. An expert review method means that one or more experts look for accessibility problems in the website. An expert walkthrough evaluation was followed, in which the expert tests the homepages by performing several tasks that are familiar for users and identify any accessibility problems (Lazar, 2006). The expert who evaluated the web pages for this study had good experience with web accessibility barriers, as well as, his evaluation was based on the WCAG 2.0 level A, section 508 of accessibility standards, the problems encountered when completing the tasks using JAWS screen reader and investigating elements using Firefox accessibility plugin.

Regarding data analysis, Statistical Package for the Social Sciences (SPSS-16.0) was used to provide basic descriptive statistics for the data.

## **Results**

For the part of responses related to environmental and technological barriers in both computer labs and libraries, averages of responses ranging from (0.00-0.33) indicate high barriers; averages of responses ranging from (0.34-0.66) indicate mid barriers; and averages of responses ranging from (0.67-1.00) indicate low barriers.

Table 1 shows the availability of some facilities that help students with disabilities to reach to computer laboratories and libraries in their institutions and the resources available by them. Although over all means in both computer labs and libraries indicate moderate barriers, it appears that the most environmental barriers are the unmarked equipment with accessible labels, unavailability of visible audio warning signals and unlabeled computers with accessible features. Disappointingly, most elevators are not accessible for students

with disabilities. That is, averages of responses in computer labs and libraries are 0.17 and 0.29; respectively, that indicate elevators have no auditory and visual signals for floors.

Thankfully, the availability of ramps in buildings entrances show the lowest environmental barrier in both computer labs and libraries with averages of 0.78 and 0.86, respectively. The availability of tables with appropriate heights for several use in both computer labs and libraries doesn't appear to be a barrier, too, with averages of 0.67 and 0.83, respectively.

**Table 1. Environmental barriers in computer labs and libraries**

Environmental barrier	Computer labs	Libraries
	Means	Means
Are pathways and entrances to the building have ramps as alternative for a person on a wheelchair?	0.78	0.86
Are aisles kept wide and clear for wheelchair users?	0.44	0.86
Have stick out objects been removed or minimized for the safety of people with motor or visual impairment?	0.50	0.86
Are ramps and/or elevators provided as alternatives to stairs?	0.33	0.57
Do elevators have both auditory and visual signals for floors?	0.17	0.29
Are elevator controls marked in large print and Braille or raised notation?	0.22	0.43
Can people seated in wheelchairs easily reach all elevator controls?	0.28	0.43
Are equipment's (e.g., printers or scanners) in the library or the computer lab marked with large print and Braille labels?	0.06	0.14
Are high contrast signs, Braille labels, large prints used in the library and in the lab?	0.56	0.57
Are computers with accessible features labeled clearly?	0.17	0.14
Are audio warning signals available visually?	0.06	0.14
Are safety alarms, telephones and room controls (lighting, heat, air conditioning, windows, window shades) within the reach for a person with a disability?	0.33	0.43
Are printed materials, computers and other services within the reach from a variety of heights, so wheelchair users and little people can access?	0.39	0.57
Are service desks wheelchair accessible (i.e., the tops of accessible tables and counters shall be from 710 mm to 865 mm above the finish floor or ground)?	0.33	0.43
Are there tables in libraries high enough so that students who use wheelchairs can fit under them?	N/A	0.83
Are private study rooms, or study carrels available for people with disabilities who need to use personal equipment, or who need the assistance of a reader, or who are distracted by noise and movement around them?	N/A	0.67
Is there at least one adjustable computer table accessible to users of wheelchairs or crutches? The height of desks, at least one for each workstation type: between 29 and 33 inches (73.7 cm - 83.8 cm) varies with individual wheelchairs	0.67	N/A
<b>A total average</b>	0.35	0.51

For technological barriers in computer labs, Table 2 provides examples of equipment or assistive technologies that are needed for students with disabilities to be able to use

computers and/ or access information. As shown in this table, most averages of responses indicate high barriers. For example, the unavailability of special devices for students with disabilities (e.g., keyboards with large prints, Braille labels and home-row key indicators).

**Table 2. Technological barriers in computer laboratories**

Technological barriers	Means
Are wrist rests available for those who require extra wrist support while typing?	0.06
Are keyboards with large prints, Braille labels and home-row key indicators available?	0.00
Are screen readers (e.g., JAWS and NVDA), screen enlargement software (e.g., Zoom text), and voice recognition software (e.g., Dragon Naturally Speaking) available?	0.12
Are large monitors available (i.e., 21" or larger monitor)?	0.29
Are headphones and volume adjustment available on the computers?	0.12
Are the documents available in alternative formats (i.e., Braille, audio, large text, and electronic)?	0.06
Are keyboard guards available to assist those who have limited fine motor skills?	0.06
Are alternative keyboards, mini-keyboards, or extended keyboards available for users with mobility impairments?	0.06
<b>A total average</b>	0.10

For technological barriers in libraries, results in Table 3 provide examples of AT devices and services that are needed by students with disabilities to be able to access information. As shown in the table, some devices that benefit only people with disabilities are not presented in the library at all. For example, average responses for the availability of magnifiers for people with visual impairment, as well as, the presence of communication devices for people who are deaf are 0.00. Also, average responses point out high obstacles related to unavailability of sign language translation service; unavailability of large print and Braille versions of library handouts and guides; non-provision of both shelf and stack identifiers and call numbers on book spines in either large print or Braille formats; and unavailability of computers with accessible features (i.e., with screen reader and screen magnifier software). However, it seems that the availability of some services and special devices is moderate; such as electronic mail and phone services for borrowing and reserving books and other references, closed-circuit televisions CCTV to enlarge printed resources, and alternative formats for some documents and references (e.g., Braille, large print, audio and electronic text).

**Table 3. Technological barriers in libraries**

Technological barriers	Means
Are computers with accessible features (i.e., with screen reader and screen magnifier software) available?	0.14
Are shelf and stack identifiers provided in large print and Braille formats?	0.17
Are call numbers on book spines printed in large type?	0.17
Are telecommunication devices for the deaf (TTY/TDD) available? Tele Typewriter– a device that uses text instead of voice to communicate via telephone lines	0.00

Are borrowing and reserving books and other references services available by phone, and electronic mail?	0.50
Are closed-circuit televisions CCTV available to enlarge printed documentation?	0.50
Are large print and Braille versions of library handouts and guides available?	0.17
Are Talking Book and Braille books available for persons who are blind or who have low vision or mobility impairments?	0.33
Are readers and research assistants' services available to persons with vision impairments?	0.33
Are sign-language interpretation services available by request for library sponsored events?	0.17
Are magnifiers available in the library to help students with low vision reading the books?	0.00
Are documentation provided in alternative formats accessible to people who have low vision and people with visual disability (e.g. Braille, large print, audio and electronic text)?	0.43
<b>A total average</b>	<b>0.24</b>

Averages of responses is used to indicate staffs' awareness and their technical skill on using assistive technologies and accessible environment. Averages of responses range from (0.00-0.33) indicate low level of awareness; averages of responses ranging from (0.34-0.66) indicate mid-level; and averages of responses ranging from (0.67-1.00) indicate high level.

Accordingly, results in Table 4 show that averages of responses in both libraries and computer labs indicate low levels for the majority of the listed items. That is, for most of the participants, they have not received training in both adaptive computer technology and policies and procedures for providing help for persons with disabilities. Also, most of them don't know about the procedures they may follow in order to ensure quick responses to request adaptive technology that are not currently available. Moreover, they are not notified about any staff member who uses sign language, if available, to assist students who are deaf. However, average responses on familiarity with accessible technology and accessible environmental settings indicate moderate levels with averages of 0.43 and 0.50, for library staff and computer lab staff respectively.

**Table 4. Awareness and preparation of participants in libraries and computer labs for assistive technologies and accessible environment**

Awareness and preparation of assistive technology and accessible environment	Library Staff	Computer Labs
	Means	Means
Are you familiar with accessible technology and accessible environmental settings?	0.43	0.50
Have you trained in the use of adaptive computer technology?	0.14	0.11
Have you trained in policies and procedures for providing help to persons with disabilities?	0.14	0.17
Do public services staff wear large print name badges?	0.43	0.28
If any staff members are trained in sign language, are they identified to other staff members so that, when available, they can assist people who are deaf?	0.14	0.11
Do you know the procedure to ensure quick responses to request adaptive technology that you do not currently have available?	0.14	0.00
<b>A total average</b>	<b>0.24</b>	<b>0.20</b>

Regarding responses to the open-ended question related to the kind of services offered by respondents' institutions to students with disabilities, Table 5 provides a list of specific services available. It seems that there is an agreement among librarians and computer lab staff on the presence of the basic environmental facilitations for accessibility. However, for computer lab staff, specific statements by some participants reveals that they are not aware of the presence of students with disabilities enrolled in their institutions.

**Table 5: Services offered by participants' institutions to students with disabilities**

Providing entrances for wheelchairs Availability of private rooms and books in Braille format Reading for students with visual impairment using voice recording Services for borrowing and reserving books and other references	} Library staff
The presence of elevators Changing the place of the hall to the first floor instead of the upper floors There is no students with disabilities attend the institution, so, no need to have such services Providing ramps for wheelchairs	} Computer lab staff

Results in table 6, indicate that web developers and e-learning staff have moderate level of awareness regarding specific technical features to be available in accessible web sites. Most responses to the items listed in the table indicate moderate or high level of awareness except for completion of online forms which seems that respondents are not aware that these should be designed to allow users of assistive technologies to access the information and field elements easily with an average responses of 0.17.

The specific technical features with highest awareness level are: all non-text Content have appropriate, equivalent alternative text; keyboard equivalent is provided for all actions; and a link is provided for the user to skip the navigation bar.

**Table 6. Web developers and e-learning staff's awareness of specific technical features to be available in web sites**

Technical features	Means
Are all electronic forms that are designed to be completed online allow users with assistive technologies to access information, field elements, and functionality required for completion and submission of the forms include directions and cues for use?	0.17
Color is not used as the sole method of conveying content or distinguishing visual elements.	0.50
Keyboard equivalent is provided for all actions accomplished using only the mouse.	0.67
All non-text Content (e.g., images or buttons) have appropriate, equivalent alternative text.	0.67
A link is provided for the user to skip the navigation bar (and other page elements that are repeated across web pages) and allow the user to enter directly to the main body of the webpage?	0.83
The web pages have a descriptive and informative page title.	1.00
<b>A total average</b>	0.64

Table 7 show results for awareness of and/or readiness for implementing general and technical web accessibility guidelines by web developers and e-learning staff. The total

average indicates low level. It seems that most of participants are not familiar with web accessibility guidelines with an average response of 0.33. When they were asked to mention the sources they rely on when developing their institutions' websites to be accessible, only 33% of them mentioned WAI and W3C as the main source (See table 8). On one hand, most of them are unaware if their institutions apply web accessibility guidelines and standards, as well as, they do not check the accessibility of their websites for persons with disabilities with average responses of 0.17 for each.

**Table 7. Averages of awareness of, preparation for application of web accessibility guidelines by web developers and e-learning staff**

Are you familiar with web accessibility guidelines?	0.33
Are accessibility guidelines and standards are applied on your institution's website (i.e., student services, instructional material, administrative information, and information for the general public, library)?	0.17
Do you check the accessibility of your institution's website for persons with disabilities?	0.17
Have you trained in the use of adaptive computer technology?	0.00
Have you trained in policies and procedures for providing help to persons with disabilities?	0.50
Do you know the procedure to ensure quick responses to any complaints regarding web site accessibility for students with disabilities?	0.33
<b>A total average</b>	0.25

**Table 8. Accessibility guidelines sources**

Source	Percentage
Internet documents	17%
WAI and W3C	33%
Jordan Higher council for persons with disabilities	17%
No answer (I don't know)	33%

Table 9 provides list of responses to the open-ended question related to hindrances of the absence of AT (hardware or software) in both libraries and computer labs, as well as hindrances for not developing accessible websites. All responses were reviewed for the three categories and briefly listed in outlined points where each of them highlights a specific issue to be considered in the discussion and recommendations of this paper.

**Table 9: Probable factors that impeded providing of AT or developing accessible websites**

<ul style="list-style-type: none"> <li>• No awareness of the availability of such technologies/ Lack of knowledge about such hardware and software</li> <li>• There is no students with disabilities come to the library</li> <li>• Financial matters</li> </ul>	}	Library staff
<ul style="list-style-type: none"> <li>• No willing from the higher management/ Lack of desire by the administration</li> <li>• There is no interest in such technologies</li> <li>• Financial matters</li> <li>• lack of legislation</li> </ul>	}	Computer lab staff
<ul style="list-style-type: none"> <li>• It is not a priority for the institution</li> <li>• There is no students with disabilities use the website/ No complaints about the website accessibility for people with disabilities</li> <li>• Financial matters</li> <li>• No enforcement of the law</li> </ul>	}	Web developers and e-learning staff

Regarding web sites' review of the institutions, an expert evaluated homepages (see table 10) through responding to a checklist addressed several web accessibility barriers. Results are listed in table 11 and they show that the three universities have accessibility barriers in most of the tested items whereas the two colleges had better results. For example, in the case of number of tabs are needed to bypass menus and content to access the main content of the page and to start the task, the two colleges have no menus in the homepage. However, one of the main accessibility problems that is found in all websites of targeted institutions is that there is no skip navigation link on any of them.

**Table 10. Universities and Colleges web sites**

Institution Name	Website
Almafraaq College	<a href="http://jormulti.blogspot.com/2012/01/blog-post_04.html">http://jormulti.blogspot.com/2012/01/blog-post_04.html</a>
Cortoba College	<a href="http://www.cordoba-edu.com/">http://www.cordoba-edu.com/</a>
The Hashemite University	<a href="http://www.hu.edu.jo/">http://www.hu.edu.jo/</a>
Alzarqa University	<a href="/http://www.zu.edu.jo">/http://www.zu.edu.jo</a>
Al Albayt University	<a href="http://www.aabu.edu.jo/">http://www.aabu.edu.jo/</a>

**Table 11. Accessibility problems found by the expert in the homepage**

	Tested element	Almafraaq College	Cortoba College	Al Albayt University	Alzarqa University	The Hashemite University
<b>1</b>	Homepage has a descriptive and informative page title	No	Yes	Yes	Yes	No

2	Homepage links have a descriptive names	Yes	Yes	Some image links do not have a descriptive text	Some image links do not have a descriptive text	Some image links do not have a descriptive text
3	Number of tabs to reach the homepage main content	2	3	34	27	36
4	Are there elements in the webpage that cannot be accessed using the keyboard	No	No	Yes, the sub-menus and tabbed form can be reached only using the mouse	Yes, the sub-menus can be reached only using the mouse	Yes, the sub-menus can be reached only using the mouse
5	Number of images with no alternative text	1	6	13	5	10
6	The availability of "skip to main contents" links	No	No	No	No	No
7	There is a content that is presented according to time which cannot be controlled	No	No	Yes, there is moving advertisements	No	No

Figure1 and Figure2 provide more examples of accessibility problems found in two of the evaluated universities



Figure 1. Homepage of Alzarqa University with no alternative text for images



**Figure 2. Homepage of Al Albayt University with tabbed forms that cannot be accessed using the keyboard**

## **Discussion**

Having accessible higher education is imperative as number of students with disabilities is increased in these settings. Part of this accessibility is to access different facilities and services in related institutions including libraries, computer labs and websites. In this study, availability and needs to access these facilities and services were investigated through surveying awareness and preparation of staff working in these settings.

For environmental accessibility to, and inside, libraries and computer labs, the results imply that the investigated institutions have barely accessible features. Although total averages indicate moderate barriers; taking into account that it is a bit better in the libraries, averages for specific items indicate high barriers. This might be due to variety among different categories of disabilities and their uniqueness needs to specific modifications and features to reach the services in the building and navigate inside them. This consistent with Al-Zboon and Hadidi study (2013) that indicated low level of the availability of international standards in the domain of library building for people with visual disability in Jordan. As well, this agrees with statements of students with visual impairment and mobility challenges in Ekwelem study (2013) that establishment of libraries does not take into considerations needs of users with disabilities.

In related that the total average in libraries is a bit better than in the computer labs, this might be related to that staff in computer labs are not aware of the presence of students with disabilities enrolled in their institutions; as was stated by some participants. This is clear when they were asked about services are provided by their institutions to students with disabilities where some of them mentioned the presence of elevators. They neglected the absence of special features in the elevators which restrict of being used independently by a wide range of students with disabilities although their responses regarding the environmental barriers indicated this issue. Moreover, there was no focus in their responses on services are provided to students with disabilities by the computer lab itself, where it is supposed that they are professionals in computer technologies hardware and software; rather that they mentioned services available in the institution generally that could be noticed by anyone. This implies they are not aware of or understand specific needs to students with disabilities in these settings.

Regarding technological accessibility in both libraries and computer labs, it is obvious from the results the vulnerability of accessibility with total averages that indicate high barriers. Again, this consistent with Al-Zboon and Hadidi study (2013) that indicated very low level of the availability of international standards in the domains of tools, equipment and new technology and sources of information for people with visual disability in Jordanian libraries. Also, this agrees with findings of Al-Hmouz (2014) study related to unavailability of assistive devices and all necessary resources of learning for most of students with disabilities were attending one of public Jordanian universities, as well as, reasonable accommodations that are provided to them were inadequate. However, this inconsistent with what Fichten et al. (2003) found that in the investigated institutions

“computer technologies were up-to-date [and] there were adequate adapted computers in specialized labs”.

According to participants, hindrances of the shortage of assistive technologies available for students with disabilities including hardware and software they need to access information might be due to several factors. These are: no interest or lack of awareness of the availability of such technologies and its advantages; it is not a priority for higher managements or there is not an urgent need for administrations to equip libraries and computer labs with such technologies given that small number of students with disabilities, if any, use these services; lack of financial resources available given the cost of provision such technologies; and absence of mandatory and in force laws and legislation. Several of these factors have been cited in the literature where they were counted as barriers or obstacles to provision of needed assistive technologies (Ekwelem, 2013; Gilson, & Dymond, 2012). However, according to Fichten and her colleagues (2003), there was agreement in the investigated institutions “that administration reacts positively concerning computer accessibility; and that outside agencies provide students with appropriate equipment”.

Furthermore, part of the previous results might be justified through looking at responses to the last part of the questionnaire related to participants’ awareness and preparation in these settings for assistive technologies and accessible environment which represents low levels. This agrees with Al-Zboon and Hadidi results (2013) of very low level of the availability of international standards in the domain of human resources in Jordanian libraries. Unfortunately, although it was reported that it is important for library staff, with whom students with disabilities interact, to be knowledgeable and aware of their disabilities and related needs (Heaven, 2004; Carter, 2004), results of this part of current study reveals that there are no indicators that administrations of universities and colleges provide training for the staff or give them information about available solutions for accessibility. As well, this points out that there is shortage of staff who are experienced with accessibility issues. It seems that this consistent with results of Fichten et al. (2003) that indicated agreement among the investigated institutions regarding inadequate “opportunities of employees to learn about specialized accessible computer technologies, availability of a specialist in adaptive hardware and software on campus [and] ability of computer support personnel to service computers with adaptive hardware or software”.

In relation to the low level of awareness and readiness of participants for developing accessible web sites, according to the respondents, many reasons have contributed to this situation. These include: lack of awareness of the presence of users with disabilities as there were no complaints about web sites accessibility by them, weak planning and implementation, lack of organization support, insufficient training for staff and web developers, and most of all the absence of national accessibility guidelines and evaluation policy. This agrees with what was cited in Abuaddous and her colleagues (2016) where many of these previous reasons considered as challenges for developing accessible web sites. According to Henry (2006), in order for web sites to be accessible; understanding of the interdependencies between the technical components (web content, technical specifications, authoring tools, evaluation tools, user agents and ATs) and human components (tool developers, users and content developers) is needed.

Regarding accessibility problems found by the expert in the homepages, results show that the three universities have accessibility barriers in most of the tested items whereas the two colleges have better results. This might be due to that colleges have very simple home pages with no much information for students. This consistent with findings of Hackett and Parmanto (2005) that the more complicated higher education web sites the less accessible for students with disabilities.

Note that although the responses of web developers and e-learning staff indicate their moderate knowledge about specific technical features to be available in accessible web sites, the expert's review point out failure in all of these features in examined institutions' web sites. It seems that there is a gap between knowledge and application. This might be either due to the previous result of low level of awareness and readiness of participants for application of web accessibility guidelines, or due to the absence of understanding of the interdependencies between the technical components and human components of web sites as was indicated by Henry (2006).

### **Conclusions and Implications**

This study address the current status of higher education accessibility by students with disabilities in Jordan. The results clearly illustrate the weaknesses of understanding and implementing accessible environment, technology and web sites in the majority of investigated Jordan higher education institutions. As well, results reveal lack of awareness and preparation for staff about students with disabilities, their uniqueness needs and services they need.

Although the government role is the most critical role in eliminating barriers faced by students with disabilities in higher education, other stakeholders such as; developers, private sectors and educational institutes have pivotal role, too, and complement the role of the government. Following are suggested policy implications that need to be considered.

#### **Public Policy (Government)**

First and foremost, national accessibility laws and guidelines have to be in place. Moreover, government needs to implement manuals and instructions that ensure implementing accessible environment, technology, and web sites of higher education institutions. A reconstruction plan is also needed to improve and enhance the accessibility of current higher educational institutions. This requires a strong commitment of Jordan MHE in implementing accessibility guidelines in universities and colleges to insure equitable access and equal opportunities to students with disabilities.

In addition, both MHE and Higher Council for the Rights of Persons with Disabilities (HCD) need to work closely to support these efforts, increase environmental and technological accessibility barriers awareness, planning national accessibility policies, and evaluating the successful implementation of accessibility policies by higher educational institutions in Jordan.

The government needs also to enforce applying the accessibility guidelines. It has to determine the minimum level of acceptable accessibility in all contracts when building computer laboratories, libraries or developing web sites in higher education institutions.

### **Educational Institutes**

Schools, universities, and other teaching institutions need to cooperate with government and private/ public educational sectors to develop and improve services provided for students with disabilities. That is, to bridge the accessibility gap, higher education institutions are required to provide ATs in both computer laboratories and libraries and make them available for students with disabilities to be able to access information in the format they need. As well, they need to provide extensive and sufficient training for staff and developers to increase their awareness and knowledge of students with disabilities, their needs and related accessibility issues. Further, they need to encourage students with disabilities to navigate the web, use computer labs and libraries. This can be done by having announcements about services and facilities that are available for them, hold workshops and training related to the use of available ATs as needed.

Moreover, web accessibility needs to be part of programs and curriculum of computer science and information technology departments in the universities. This would help to increase awareness of web accessibility guidelines and how can they be applied when designing or developing web sites. This is kind of pre-service preparation programs for prospective web sites developers and computer lab staff.

Many of the constraints can be solved by merely having a desire to do so. Overcoming such constraints can be achieved if the educational institutions have support from government agencies and civil society organizations.

### **Web Developers and e-learning staff**

Web developers and e-learning staff are key elements to web accessibility. Enlightening and educating current web developers on the importance of adopting and implementing web accessibility guidelines by offering those training courses on how these guidelines can be applied in practice will significantly improve the accessibility of their institutions web sites. Another issue to be highlighted is testing of the higher education institutions web sites. This should involve users with disabilities and it has to be performed as successive cycles.

### **Limitations and Future Research**

It is worth to be mentioned that this research findings are limited to the time of data collection, the settings where the study was conducted and the sample from whom the data was collected. This should be taken into consideration for generalizability issues and when interpreting the results. Other studies can be carried out to present other parties' perspectives about available services, barriers and needs to better understand the current status and what to consider for future plans and decisions. This might include students with disabilities themselves from different categories, administrators and other stakeholders. Further, for the purposes of this study, it was appropriate to perform quick check of the accessibility of the homepages of higher education institutions; however, for future research, the authors suggest to evaluate the entire web sites accessibility of these institutions and not solely evaluating the homepages for more accurate results (Hackett & Parmanto, 2005).

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