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Emerging visually impaired in academic libraries

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Abstract

This study sought to investigate access services that are presented to visually impaired users in academic libraries. There is a clear lack of digital resources and assistive technology in serving disabled/blind users in both libraries. Based on Mann-Whitney U-test results and *p-value*, there were similarities in website and databases accessibility and significant differences in providing some types of digital materials to visually impaired users. It is recommended that libraries have to continually adapt to the constantly turning cycles of technology in terms of major technology trends such as open-source software, mobile technology, and voice-activated technology. The world needs to see libraries deploying the latest phase of change because users increasingly engaged with services through voice-activated technologies like Alexa, Google Home, Cortana, etc. in addition to the current larger-scale technology that is essentially relevant to the libraries, like integrated library systems (ILS), library services platforms (LSP), customers discovery services (CDS), and e-book lending technologies.

Keywords: access services; information resources; assistive technology; visual impairment.

Background and Context

Dramatic changes in information technologies exists all over the libraries in the world in the past two decades. These technologies enhanced information discovery and access services in the libraries (Rocha et al., 2021; Salisbury & Griffis, 2014) to all age periods to provide individuals with the suitable materials they need. Focusing light on disability in the group of people faces many challenges including physical and virtual accessibility (Pawluk, 2015; Toledo, 2012). Thus, most of the entities in the developed world followed systematic procedures in evaluating their services presented to individuals with disabilities, and the necessity to implement equitable access to emerge diverse users in information organizations environments (Gul & Khowaja, 2020; Hirsh, 2018).

Academic libraries play an essential role in the universities and colleges by presenting a variety of information resources and services to college students in both physical and virtual spaces (Majinge & Stilwell, 2013). Their role has developed with the increasing of digital collections with the adoption of Web 2.0 technologies (Copeland, 2011; Bonnici et al., 2009) and beyond, with adopting new techniques that lead to a model of changes in libraries services (Madhusudhan & Lamba, 2021) to help users find and get access to the information they need both directly through users-facing reference services or indirectly through the behind-the-scenes constructing of metadata (Breeding, 2018). Academic libraries, with the new scope of presenting distinguished services to all users, utilize

assistive technology tools for persons with disabilities by presenting technology resources that include hardware and software techniques to enhance their accessibility into library traditional and digital materials (Méndez, 2001; Rowley, 1997). Visually impaired people in the world are about 1 billion people, including those with moderate or severe distance vision impairment or blindness due to unaddressed refractive error (88.4 million), cataract (94 million), glaucoma (7.7 million), corneal opacities (4.2 million), diabetic retinopathy (3.9 million), and trachoma (2 million), as well as near vision impairment caused by unaddressed presbyopia (826 million) as reported in World Health Organization website (2021). All of these persons face numerous challenges in this world, in seeking information they need, accessing buildings, participating in social activities, and in feeling safe and being treated equity just like their able-peers.

It is widely believed that information technologies supply a variety of information resource formats for persons with visual impairment. The term includes “low vision”, “legally blind”, and “totally blind”. *Totally blind* is defined as “the lack of light perception and the individual inability to see anything” (Farlex Partner Medical Dictionary, 2012). In this paper, we referred to the totally blind ones with visual impairment. Students with visual impairment need special tools and certain formats of information resources to get the information they need. Literacy has promoted from low-tech devices such as reading magnifiers to complex high-tech Braille printers dramatically with the Digital Age, and with the educational benefits transaction (Madhusudhan & Lamba, 2021; Moore & Cahill, 2016). Information has an active role in networking and sharing knowledge. Information organizations that open up access, publicize and establish free information flow in electronic channels and platforms, will make growing harmonic communities (Stephens, 2018). Weinberger (2012) suggested five foundational concepts to “help to make networking of knowledge the blessing it should be”: a) open up information access, b) provide the hooks of intelligence (metadata), c) hyperlink everything, d) leave no knowledge behind, e) and outreach everyone. However, opening up resources to be accessible digitally anywhere is still underway for more than a decade (Joseph, 2018). Information organizations are restricted with copyright issues the way makes the resources partially accessible.

Academic libraries and their services provided for individuals with visual impairment have been examined in many research papers, for example, Xie et al. (2015) in their study entitled “*Using digital libraries non-visually*” aimed at discovering the visually impaired patrons' situation of help-seeking when interacting with digital libraries. The researchers found that that, through experiments, seventeen help-seeking situations, individuals visually impaired faced, while using digital materials or electronic services in the library, were identified. In particular, these patrons faced difficulties in accessing information, identifying the current status and path of electronic information, and difficulties in evaluating information efficiently. Therefore, the study explored that there was a critical gap between current digital library design practices and blind users' needs, so more practical implications for more blind-friendly digital libraries are suggested in the paper.

In addition, the challenges that face visually impaired users in the learning process haven revealed in Okobi's study (2014); accessing information resources, the use of Technologies, and the need to gain alternative materials of written texts to either Braille or audio- texts are the main challenges that face visually impaired students. Although Assistive Technology helps people with visual impairment to read a text like a computer

or mobile screen reader, many websites in the world are totally or partially inaccessible for people visually impaired. The same conclusion was explored in Yang and Chen's study (2015). They discovered that disabled persons are “at risk of being left behind in this growing age”.

Focusing light on the users with disabilities access to electronic resources and databases was the main objective of many research papers such as Cavazos et al., (2021); Ali and Bady (2016); Ahorany (2011); Copeland (2011), Burke (2009), and Caballero-Cortés et al. (2009). To have total accessibility to electronic resources was the main missing feature detected in information services provision. Going through Cheung and other's study (2020), the authors encouraged information resources vendors to move libraries at varying speeds in servicing patrons visually impaired by providing them with accessible web gates and websites interfaces, platforms, mobile apps, and databases. The researchers revealed the importance to add extra measures of reference services assistance for patrons visually impaired in using, accessing, and retrieving information from data warehouses and databases. In addition, improving accessible art exhibitions were presented as a formative study (Cavazos et al., 2021) to help visually impaired participants not only in libraries but also in museum and galleries, through presenting an approach to an interactive multimodal guide prototype that uses audio and tactile modalities to improve the autonomous access to information and experience of visual artworks.

It is commonly recognized that disabled students' involvement in reading is important for their competencies and academic path, “since the 1990s researchers have been investigating the relationship between time spent reading and positive outcomes” (Moore & Cahill, 2016). Furthermore, digital resources in audio formats can model reading, teach high skills of listening, encourage speaking or oral language usage, increase understanding, comprehension, and promote vocabulary effectively.

On the other hand, despite the announcement of the Americans with Disabilities Act (ADA), IFLA, and UNESCO guidelines that were built to guarantee the rights of people with disabilities to get equitable access to information, public accommodation, transportation, and employment, widening accessibility requirements, and implementing these guidelines need to be taken into account (Dolores-Fernandez, & Del-Mar-Sanjuan, 2011) to fill the gap of adopting technology in accessibility across students who are blind.

Study objectives and hypothesis

The main objective of the current study is to discover what type of information services are provided to visually impaired users in the academic libraries at the University of Jordan and the University of Cairo UC and to recognize similarities and differences in both groups using ServQUAL survey. Dimensions of Information resources, assistive technologies, and communication mediums are investigated in this paper. Thus, the objectives of the study will be as follows: a) To identify digital collections and information access in the academic libraries, b) to determine the use of assistive technologies in serving visual impaired users, c) to determine the new trends in technologies that libraries have to adopt to shift to service-oriented newly phase, and c) to mark similarities and differences in information resources and accessibility between the two libraries in UJ and UC.

The main hypothesis that will be tested is as follows:

1. **H₀**. There are no significant differences between UJ and UC's means ($p < 0.05$).
2. **H_a**. There are significant differences between UJ and UC's means ($p < 0.05$).

Methodology

To achieve this purpose, we adapted the Sequential Explanatory Strategy, which is characterized by the collection and analysis of quantitative data followed by a collection and analysis of qualitative data to use qualitative findings to supply in explaining and interpreting the findings of quantitative results (Hartley & Muhit, 2003). Mixing quantitative and qualitative methods (surveys and interviewing) to provide a better understanding of the research problem and enable triangulation than either method alone (Creswell, 2014).

Survey method

Participants of the questionnaire are staff from two academic libraries in UJ and UC which took place in early 2017. The researchers have chosen to hear the voice of staff after conducting a research that targeted the users visually impaired in 2016. The sample was randomly selected. SERVQUAL survey, a well-published and widely used measure tool, was adopted as a global questionnaire for measuring services quality and reformulated to be suitable with libraries services. The researcher added different demographic characteristics including gender, age, degree earned, and job position. After then, calculating the frequencies and percentages of the sample characteristics was run using SPSS20. The results are shown in (Table1). The survey also assessed the following elements: (a) the staff's perspectives towards the availability of information resources, (b) availability of assistive technologies, and (c) librarians' use of social applications in the process of providing information services. We applied Likert scale options (completely agree, agree, neither agree nor disagree, disagree and completely disagree) to measure dimensions.

Data analysis

The normality of data distribution was calculated by measuring the means, standard deviations, and skewness values. Both estimates remained within the 95% Confidence Intervals. According to Piovesana and Senior (2018), means and standard deviations, and skewness are used to compute the normality of sample sizes from 10 to 100. The data didn't meet the assumption of normality, thus, a *nonparametric Mann-Whitney U-test* was run to analyze group mean differences (Blundell et al., 2017), and the alternative nonparametric *Kolmogorov-Smirnov KS equivalent test* was also run for more validity (Vrbik, 2018). The mean values were calculated based on their numerical values (from 1 to 5). To avoid long tables, a few features are displayed in figures to check the multiple differences. (Figures 1 and 3) show means and standard deviations, and (figures 2 and 4) correspond to *Mann-Whitney U-test mean rank values* based on the comparison between the two groups.

Interview method

In *the interview method*, *Snowball sampling* was used for examining the challenges the librarians face in information services provision. We sample based on interviewing people who are relevant to the research questions (Bryman, 2004). Snowball sampling is used in qualitative research for the identification of rich-information cases (Palinkas et al., 2015). Personal invitations were submitted via email to librarians from two academic libraries in UJ and UC. The sample consisted of 7 women and 6 men. The original interview texts were gathered in (Arabic and Spanish) and translated into English. A content analysis process was run by using qualitative data analysis software

(Monkeylearn¹) to extract the sentiments of the interview texts, and to carry out the word cloud graph.

Response rate

In the academic library of UJ, 35 questionnaire copies were distributed. Staff responded were 26 with a response rate (74.2%), and in UC, 67 copies of the questionnaire were distributed. 52 librarians responded with (77.6%) average percentages of the entire sample

Validity and reliability

For collecting data the researcher applied surveys and interviewing as methods that enable *triangulation* (Creswell, 2014; Babbie, 1989) and increase the validity of the study. This technique gives hope to overcome the weakness or bias and the problems that come from using a single method (Bogdan & Biklen, 2006). Another way of boosting the validity of the study was *peer review*. Duggan (2010) utilized the peer review technique to maintain standards of quality and improve performance for his scientific work. For the reliability of the benchmarks questionnaire, the researcher conducted *Cronbach's Alpha* measure tool through SPSS 25 to get the rate of stability of the study tool. The reliability score of any study tool should be between 0.60 and 0.97 to obtain stable responses each time (Hair et al., 2006). Our total was 0.831, which means that the multiple-question Likert scale survey is reliable.

Results and discussion

This section interprets the data gathered from two university libraries in Spain and Egypt using mixed method processes, surveys, and interviewing. The main objective of the study is to establish whether information services provided to visually impaired users in the academic libraries in UJ and UC have statistically significant differences or not.

First: Demographics

There were 68 respondents from the two academic libraries of UC and UJ. Table1 corresponds to the demographic details of participants in the surveys. 75.6% of the respondents from library staff are females, 24.4% are males. A total of 57.1% of participants are more than 40 years old, and 78.2% of the respondents hold a Bachelor's degree. The majority were librarians and only 11.5% of the sample are Information Technology IT specialists.

Second: Information access

A summary of survey results is presented in figures with interviews content analysis. The respondents were asked to give their perspectives towards information resources adequately for persons visually impaired. Figure 1 summarizes staff's responses towards information resources and accessibility in both academic libraries.

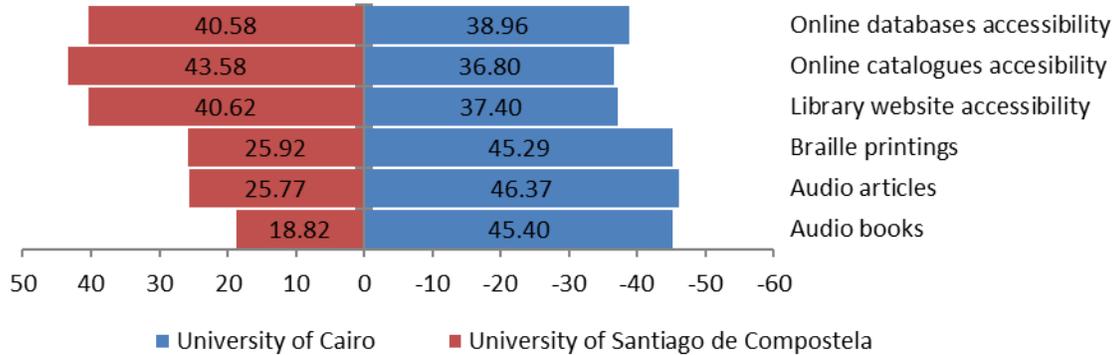
Bases on Mann-Whitney U-test results, which are shown in *mean ranks* in Figure 1 and *p-value*, there were significant differences in availability of audiobooks (18.82 vs 45.4, $p=0.000$, U-test, and KS test), audio articles (25.77 vs 46.37, $p=0.000$, U-test, and $p=0.007$, KS test), and Braille printings (25.92 vs 45.29, $p=0.000$, U-test, and KS test). Thus, the Null hypothesis is rejected. Respondents' answers in both groups related to accessibility questions were most closely based on Mann-Whitney and KS tests results. There were no statically significant differences between the two libraries' accessibility to

¹ <https://monkeylearn.com/word-cloud/>

online catalogs (p=0.173, U-test, databases (p=0.740, U-test, and p=0.1, KS test), and library website (p=0.520, U-test, and p=0.583, KS test).

Figure 1:

Mann-Whitney U-test Mean ranks of accessibility to analog and digital collections



The current study findings indicate that there is a lack of information materials in both libraries. The website and online catalog of the library of UJ are partially accessible. However, Millán-Reyes’s (2010) study revealed the perceptions of users with disabilities towards library materials, funds, library services, and infrastructures and found out that there are services available for the disabled but limited to certain places in the universities not spread in the campuses. Millán-Reyes’s (2010) study comes to a similar conclusion to the current study. Xie et al.(2015), and Okobi (2014) come to a similar conclusion as revealed in the current study, through which they explored a critical gap among current library holdings and visually impaired users’ needs. In addition, Yang and Chen (2015) study discovered that disabled persons are “at risk of being behind in this growing age”.

Third: Assistive technology

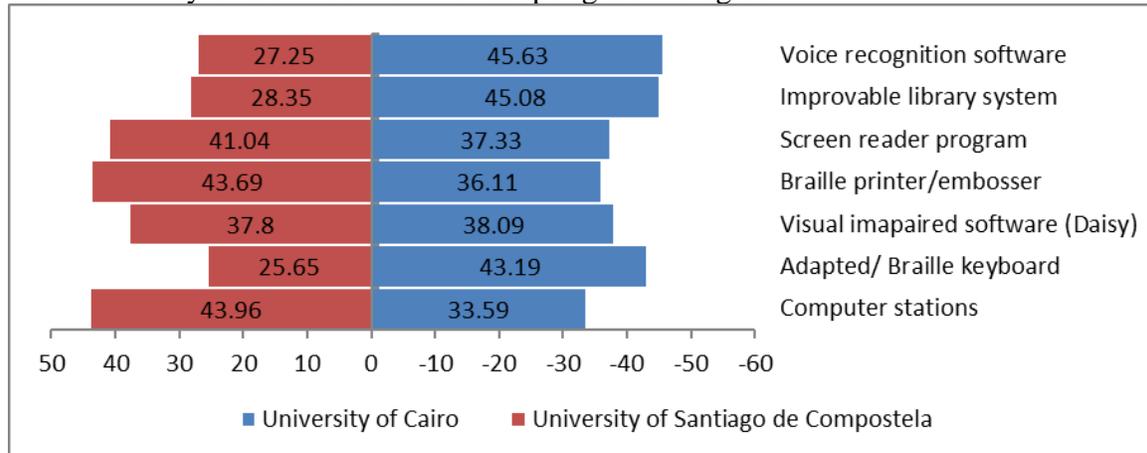
The visually impaired primarily learn via modalities including auditory, tactile, and kinesthetic modalities (Reynold & Fletcher-Janzen, 2004). In their process of seeking information, they may use accommodations such as textbooks on tape, written materials in Braille (Duggan, 2010), and a screen reader program to navigate the computer and/or mobile screens.

The findings in the current study provided the statistics of participants’ views towards assistive technologies in the library of UC. The average percentage of respondents agreeing that there is an adequacy amount of computer stations in the library for the use of the visually impaired equals 65.3%, while (67.3%) of the sample agree that there are adequate Braille keyboards (M=4) for use for visually impaired, Braille printer/embosser (M=4; 40.4%) and DAISY software (M=4; 71.2%). There are notable conflicting responses of agreeing and disagree on average percentage for the availability of Braille embosser/printer (M=3; 40.4%) which could be expressed for the inadequacy of this tool in the library, Screen Reader software (M=4; 57.7%), the improvable integrated system (M=4; 69.3%), and finally voice recognition system is in a good level (M=4; 80.7%). In contrast with UJ library, statistics of participants' view towards assistive technology are as follows: The average percentage of respondents agreeing that computer stations are adequate for the use of the visually impaired equals (80.8%). However, 42.3% of the sample agrees that there are adapted/ Braille keyboards for the use of the visually impaired. (65.4%) average percentage of the population disagree that the Braille

printer/embosser is adequate. Using DAISY software equals (69.2%), screen reader software (65.4%), and (30.8%) of respondents agree that the integrated system in the library could be improved due to users' needs. The adoption of a voice recognition system is in a very low value with an average percentage of 34.6% of the employees sampled in the UJ library.

Figure 2:

Mann-Whitney U-test Mean ranks of adapting technologies



Burke's (2009) concluded that the sample's perceptions of accessibility and assistive technologies were slightly positive and that the visually impaired must be provided with assistive technology to access library information resources. In addition, Yang and Chen's study (2015) indicated that there is a necessity to widen accessibility requirements via utilizing special techniques to get equal access as their peers. Furthermore, Majinge and Stilwell's study (2013) discussed that the information services presented in the libraries sampled aren't integrated and need to be improved through acquiring Braille materials and assistive technology devices and improving personnel competencies. However, it is found that disabled users' access to assistive technologies might not lead to their use in the underutilization of information services offered by academic libraries. This result goes with Potnis and Mallery study (2021) too.

The current study findings pay attention to the necessity of the deployment of assistive technologies. Hence, disabled users have a good chance to be self-reliant learners and more independent. There is a slight lack of assistive technology in the library of UC, but in the library of UJ, there is a clear lack of these techniques. It is explained in one of the employee's responses that there is a center/ office responsible for serving the students with disabilities in the university so that they haven't to obtain such technology in the library.

However, the library ceased to support the group of students with disabilities at the time there are more things the visually impaired need and definitely can't be found in the center, such as information resources catalogs, articles, these databases, etc. Therefore, both libraries need to revise their strategies and plans to provide all users equally with their services and need to commit to paying attention to the visually impaired by supporting them with technologies that help them to learn independently. Therefore, to get a good experience for disabled users in the library, they need to enable discovery and access to both analog and digital resources. Libraries have to continually adapt to the

If it comes to the human resources in the library, developing skills is an important issue for improving the role of the library in serving communities. Training sessions are necessary for both staff and newly enrolled disabled students in the university. They need to gain skills and knowledge about university life, information discovery, and access techniques, and to overcome any challenge they may face while seeking information.

Another core issue is raised as a challenge faces libraries that there is a clear lack of accessible information resources/textbooks either in analog or digital formats. Academics occasionally don't provide the library with the textbooks of courses that visually impaired students involve within. The lack of coordination from the academics side made a gap between the library and the departments. Producing materials in an accessible format for visually impaired users need time and previous collaboration. The sudden request for materials that are not ready for use makes academics, librarians, and users frustrated and confused.

Challenges that are found in the respondents of the interview to explain the lack of information resources, they are as follows: a) lack of budget; b) lack of qualified staff, especially in the technological field; c) lack of technologies and equipment; and, d) lack of coordination across academics, librarians, and users. Therefore, awareness of librarians' tasks and the nature of producing materials in an accessible format will enable all parts to overcome the challenge of information resources shortage. In addition, it is important to enable/activate new technologies that will support the education process like mobile technology and voice-activated technologies, in addition to the current larger-scale technologies that is essentially relevant to the libraries, like integrated library systems (ILS), library services platforms (LSP), customers discovery services (CDS), and e-book lending technologies.

Future:

The findings of this study will redound to the benefit of libraries and communities. It takes into consideration that libraries have shifted in less than a century from an information management approach to a user-centered/ content-management approach. Libraries adapt a real rapid change in the essence of their programs, technology, protocols, various groups of users, and services by reformulating their mission towards developing theories, techniques, information resources, human resources skills, and personal competencies. Technology increasingly develops to facilitate information discovery and access as efficiently as possible. The greater demand for information for college students and in particular disabled users justifies the need for more effective, life-changing, self-learning tools in libraries and deploy most recent trends of technology to redefine the profession and to shift from managing the low-level infrastructure of services to a level that is close to users.

The results of the study will be of interest to library managers, administrators, and librarians, and for researchers, the study presents a collaboration to librarianship via discussing a topic that is open for future investigation.

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