Blind Saudi Female College Students and Assistive Technologies: A Case Study

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Abstract: *This is a case-study of a blind college student, Sonia, at the College of Languages and Translation (COLT). She has an iPhone, iPad and laptop as well as a Twitter, Facebook, WhatsApp and Skype accounts. She uses MS Office and the university's Academic Portal. The iPhone VoiceOver App and the Braille Sense Notetaker enable her to surf the internet, take notes in class, synchronize her calendar and contacts, and read silently through the use of a refreshable Braille display. She gives her Camera voice commands to take photos and write captions. A navigation software helps Sonia to walk around alone. Sonia reported that the voice software helps her communicate with people better, especially on social media. Since Sonia takes listening and interpreting courses in the Multimedia Language Lab at COLT, she indicated that no screen reading software is available at the lab like HAL or JAWS. Everything is operated by the mouse, not voice. Instructors do not wait for her during the listening and interpreting classes. Although she finds the Braille Sense Notetaker very useful and handy, she cannot afford to buy it. She borrows it from the Centre for Special Needs Students at the university. Recommendations for helping blind students make the best use of assistive technologies are given.*

Keywords*: assistive technologies, blind students, assistive technologies for the blind, voce Over, Braille Sense, HAL, JAWS, Blind Navigator.*

I. INTRODUCTION

According to the World Health Organization there are 285 million visually impaired people of all ages worldwide, of whom 39 million are blind. People 50 years and older constitute 82% of all blind[1]. Despite those high figures, current advancements in information and communication technologies have made it easy for blind and visually impaired people, particularly students, to use assistive technologies to meet their educational, social, communication, and mobility needs. A review of the literature has shown numerous applications, software, and devices especially designed for blind and visually impaired students to facilitate their access to learning resources and electronic services such as adopters of iOS devices (Scott, 2013); audio game playing (Balan et al, 2017); VoiceOver Internet Protocol (VoIP) Systems (Packer & Reuschel, 2018;); audio-tactile maps of campuses as orientation and mobility aids (Papadopoulos et al, 2020); a Tablet Computer Application (App) for Helping Students with Visual Impairments Solve Mathematics Problems (Beal & Rosenblum, 2018); JAWS Screen Reader *(*Kapperman, Kelly & Koster, 2018; Ampratwum, Offei & Ntoaduro, 2016); digital talking textbooks (Hussin, Folkestad & Makela, 2013) and others.

Furthermore, some studies investigated blind and visually impaired students' preferences. For example, D'Andrea (2012) explored the use of paper Braille and assistive technology among students aged 16-22, and students' attitudes toward Braille and technology as tools for classroom learning. Results indicated the changing nature of how students use various tools, how they select approaches to complete their class assignments, and their ability to make choices regarding tools and strategies. For blind and visually impaired students to complete their school tasks efficiently, they must be competent in multiple assistive technologies and learning tools.

Although multiple assistive technologies and resources are available, blind and visually impaired students face challenges and barriers in accessing and using assistive technologies such as inconsistent policies, inappropriate universal design, lack of monitoring and accountability, lack of instructor training, and inequities in accessing bandwidth infrastructure and devices (Wu, 2018); Pavithran, 2017); and Muwanguzi & Lin, 2010). Leff (2012) added lack of interest in utilizing assistive technologies due to the high cost of hardware and software, insecurity concerning economic conditions with little or no possibility for employment, satisfaction with the status quo, lack of motivation to change, in addition to social and psychological factors like communal apathy and depression.

Moreover, teachers of blind and visually impaired students reported that students' difficulties in succeeding in higher education are due to ineffective technology resource implementation, lack of adequate assistive technology instruction, ineffective technology for accessing board-work and worksheets, lack of training in the use of the technology, incompatibility issues, time factors and lack of teacher expertise (Opie, 2018). Ampratwum, Offei & Ntoaduro (2016) and Gerber (2003) added personal factors such as individual response to training, developing students' competencies in using assistive technologies, lack of training, lack of access to

[1]https://www.who.int/blindness/publications/globaldata/en/#:~:text=Globally%20the%20number%20of%20people,are%2082%25%20of%20all%20blind

training materials, and dependence on sighted people when they need assistance. In Singapore, Wong & Cohen (2011); Wong & Law (2016) noted that inadequate knowledge amongst teachers about assistive technology resulted in inconsistencies and inadequacies in the delivery of instruction. Blind and visually impaired also have a wide range of abilities ranging from little to advanced knowledge, and gaps in assessment, collaboration, and knowledge among teachers about assistive technology. In Jordan, challenges included: (a) the willingness of some students to use a particular device, lack of assistive technologies in schools and at home, and lack of training at home; (b) external barriers related to finance, training, societal attitudes, family support, and (c) ethical issues such as exposing visually-impaired students to negative community attitudes, addiction, bullying, abuse, and extremism (Al-Zboon, 2020)

As for the status of blind and visually impaired people in Saudi Arabia, Mohammad Tawfiq Blu, secretary general of Ebsar Foundation for the Rehabilitation of The Visually Impaired, reported that as of 2020, Saudi Arabia has about one million people with visual impairment, with 75% completely blind and 25% suffering from acute vision impairment, partial vision loss, or an ailment of the retina[2], many of those are students. At King Saud University (KSU), there are 122 male and female blind students. To serve its blind and visually-impaired students better and help them achieve their educational goals, KSU has established a Blind Student Association and a Center for Special Needs Students. The Center has numerous assistive devices and software for the students to use for free such as: (a) the JAWS Screen Reader; (b) HAL Screen Reader (a voice output screen reader program); (c) Braille Sense Display and Notetakers; and (d) a Braille Embosser/Printers. However, no research has been conducted in Saudi Arabia to find out the students' level of access to different assistive technologies, how blind students in Saudi Arabia, in general, and KSU, in particular, are utilizing facilities provided to them by the Center for Special Needs Students to enable them to pursue their education, and kinds of assistive technologies they possess and use in learning, communication and moving around. Therefore, the purpose of the current study is to explore the kinds of assistive technologies (devices and software) a blind Saudi female college student majoring in languages and translation at KSU uses, what she uses those assistive technologies for, advantages and limitations of assistive devices and software as perceived by her, challenges she faces in using assistive devices and software, and her experience with the services provided to visually-impaired students by the Center For Special Needs Students at KSU.

II. SUBJECT

Sonia is a college student at the College of Languages and Translation (COLT), King Saud University (KSU) in Riyadh, Saudi Arabia. She is in her 9th semester of the translation program at COLT. She is 23 years old. She has been blind since childhood. She has a brother who is blind, too. She started using assistive technology when she was in high school. The student's real name has been concealed for privacy purposes.

III. DATA COLLECTION

The author conducted an interview with Sonia and asked her open-ended questions about the hardware and software that she uses, advantages and limitations of assistive technologies as perceived by her, the challenges she faces in using assistive technologies, and her experience with the services provided to blind students by the Center for Special Needs Students at KSU.

IV. RESULTS

4.1 Kinds of Devices Used by Sonia

Results of the interview revealed that when Sonia was in high school, she had a Perkins Brailler with keys/characters and she memorized the Braille keyboard (See Image 1). Perkins Brailler, Sonia indicated, was big and heavy and could not take it with her to school. Now (in college), Sonia has the following devices:

- **A laptop; an iPad and an iPhone.**
- **A Braille Display and Notetaker (Braille Sense)** that she borrowed from the Center, and which enables Sonia to surf the internet, take notes in class, synchronize her calendar and contacts, and read silently through the use of a refreshable Braille display. Braille Sense works as a laptop computer. It enables blind and visually impaired students to perform a variety of tasks such as writing, conservation, connecting to the Internet and browsing. It provides information through producing Braille lines or listening through a loudspeaker. The users can save and retrieve the information they need. Braille Sense contains one or more rows of cells. Each cell has the shape of a Braille character, which consists a series of dots similar to domino dots in their layout. As the information on the computer screen changes, the Braille characters on the display change too, providing refreshable information directly from the computer (See Image 2).
- **Braille embosser/printer:** It is a printer with tactile Braille cells. It renders texts in a document format. It uses a Braille translation software to emboss a document easily, making the production of a Braille

[2] https://www.arabnews.com/news/463054

text on a page efficient. Sonia uses this Braille embosser/printer at the university Center to print her course material and assignments.

Image 1: The Perkins Brailler and a Braille Page

Image 2: The Braille Sense Notetaker, Student Working on the Braile Sense, and the Braille Printer

4.2 Software Used by Sonia –

1. MS Office (WORD, PP, Excel)

2. A Screen Reader: There are numerous software app that enable blind people to use a computer. They provide the user with information about the icons, menus, dialogue boxes, files, and folders. They provide feedback to the user through Speech or Braille. They can read a whole document or part of it out loud, navigate webpages, open and close files, edit documents, and listen to music. Examples of Screen Readers that Sonia uses are:

- **VoiceOver:** This is a screen reader built into the Apple's iOS. It helps increase accessibility for blind users based on spoken descriptions. VoiceOver deals with the user's interface as a hierarchy of elements, which are navigated by various keystrokes. It supports many Braille displays. The trackpad is used to explore the actual visual layout of screen components by sliding one's finger around the trackpad to activate those components (See Image 3).
- **JAWS for Windows:** This is a Screen Reading Software from Freedom Scientific. It provides speech and Braille outputs for common computer applications such as Word, Powerpoint, and Excel. Version 6.0 supports the Arabic language (See Image 4).
- **HAL** Screen Reader is a voice output screen reader that helps blind students to peruse their education and work on everyday life activities that involve using a PC. It makes Windows dialogs, icons, buttons, menus, controls, Internet, and email easy to use. It recognizes and reads information from the computer screen and displays information in Braille (See Image 4).
- **Window Eyes** is a screen reading software application that converts components of the Windows operating system into synthesized speech allowing blind and visually impaired people complete access to Windows-based computer systems.
- **Thunder** which is a free screen reader on Windows. It is distributed with the WebbIE set of programs, which provide a text web-browser, an RSS news reader, a podcatcher, and other tools.
- **Kurzweil 1000**, a text-to-speech software for Windows. It reads a text out loud in a variety of natural-sounding voices that can be adapted to the user's preferences. Kurzweil 1000 combines traditional reading machine technologies such as image processing, scanning, and text-to-speech with communication and productivity tools.
- A voice software on a flash memory which Sonia bought from Al-Fajr Company in Riyadh, and which she has uploaded it to her laptop.

Image 3: The VoiceOver Screen Reader for iPhone

Images 4: The JAWS & HAL Screen Readers

4.3 How Technology Helps Sonia Academically

Sonia uses the laptops available at the KSU Center for Special Needs Students, because they have the VoiceOver software. She takes her exams there, and the staff at the Center send her answer sheets to COLT. She checks out a Braille Sense machine from the Center whenever she needs it. She brings it to the university. She takes notes on it during class lectures. The Center taught her how to use e-mail. With Braille Sense, Sonia can do without an assistant who used to come to class with her and takes notes for her on paper. Braille Sense is very common among blind students at KSU. She thinks Braille Sense is good for all blind students as it is portable and lightweight. She thinks HAL is easy to use, too. She gives PPT presentations in class. She is currently writing a book using assistive technology. Sonia can use Edugate, the KSU Academic Portal to register her courses, drop and add courses, view her course grades, access course evaluations, her transcripts and more.

4.4 Sonia and Social Media

Sonia has an e-mail, a Twitter and Facebook accounts. She also uses WhatsApp and Skype. VoiceOver helps her communicate with people. All her blind friends are on Twitter, too. She receives no special treatment from sighted social media users, i.e., they do not treat her as a handicapped. They treat her with respect and admiration. They show no feelings of pity towards her, which makes her feel normal and have high self-confidence. She is outgoing, has a good sense of humor and can perform everything sighted students can do. On Twitter, Sonia writes about her daily routine, social interaction, and experiences as a blind girl. She says that *"Twitter is her daily bread and butter"*. She also participates in the live lectures that the author gives via Periscope and Twitter (Al-Jarf, 2021), she joins the discussions about the translation assignments that the author gives to her followers on Twitter (Al-Jarf, 2020b). She participates in academic discussions with the university administrators and instructors on Twitter (Al-Jarf, 2020a; Al-Jarf, 2016). She can send and receive photos with her iPhone Voice camera. She gives it voice commands to take photos and write captions for those photos (See Image 5).

Image 5: Samples of Sonia's Posts on Social Media with Responses from Her Followers

Image 6: The Trekker Breeze Device

4.5 Walking Around

Before using assistive technologies for the blind, Sonia used to walk around with the help of a sighted guide and/or a cane. Now with the availability modern assistive technologies, Sonia uses the following Apps to walk around campus and elsewhere:

1) Trekker Breeze, a hand-held GPS. It allows individuals who are blind to navigate streets and intersections with a high degree of confidence. It is about the size of a smartphone. It can be operated with one hand. It has around 8 hours of battery life (See Image 6).
2) A Blind Navigator, which has the following functions: A GPS navigator, a voice guided location IVR (Interactive Voice Response), a phone, contacts, messaging, alarm, a calculator, a color identifier, games, and battery info.
3) Captain saves places and locations like a GPS. It is Arabized, has games, and she can read the Holy Quran on it.
4) A navigation software for the blind that helps Sonia save places and locations. She gives it voice commands and the navigation software saves them.

4.6 Challenges That Sonia Faces

A major challenge that Sonia faces is that she cannot afford to buy the Braille Sense Note-taker to keep it with her and use it all the time as the machine costs about $4000. Therefore, she borrows a Braille Sense Note-taker from the Center for Special Needs Students at the university. But if something goes wrong with the machine while she is using it, Sonia has to fix it at her own expense.

Another problem is that no screen reading software is available at the Multimedia Language Lab at COLT like HAL or JAWS to help her in her listening and interpreting courses that are taught at the lab. Everything is operated by the mouse, not by voice. The instructors do not wait for her during listening and interpreting classes, and none of her instructors is familiar with apps or software for blind students. She added that during exams for the General English language requirement courses (which all students at the university should take and which COLT instructors teach), blind students enrolled in the General English take their exams individually with one of course instructors. An instructor would sit with one blind student, read the questions one by one to the student, listen to the answer from her and record it by hand on the student's answer sheet. No technology is used. General English blind students do not take the exams at the Center. None of the instructors has received any training in converting exams, assignments, and handouts to Braille characters. They also feel that this is a waste of time and an extra burden for them.

A third challenge is that Screen Readers cannot read Romanized and Colloquial Arabic which many social media users use in their posts. The Screen Reader can only ready Standard Arabic written in Arabic script but cannot read Colloquial Arabic as users spell the same word in different ways, unlike Standard Arabic which has one spelling only.

V. DISCUSSION

Sonia is an ambitious and self-confident blind student majoring in translation. She is atypical blind student. She is familiar with many assistive technologies for the blind. The devices and software that Sonia uses are similar to those mentioned by prior researchers such as: Scott (2013); Balan et al (2017); Packer & Reuschel (2018); Papadopoulos et al (2020); Beal & Rosenblum (2018); Kapperman, Kelly & Koster (2018). The challenges that Sonia has in using the language lab at her college are also similar to those faced by blind and

visually impaired students in other countries as mentioned by Wu (2018), Pavithran (2017); Muwanguzi & Lin (2010) and Leff (2012).

VI. RECOMMENDATIONS

Providing appropriate assistive technology for students with visual impairment in this digital age is indispensable. Therefore, the current study recommends that the university introduce blind and visually impaired students to assistive devices, software, and Apps that enable them to keep up with their classmates and latest technologies. The Center for Special Needs Students at KSU should encourage blind students to report the software and devices that they need and should assist colleges in identifying the software and hardware required for their websites and special electronic services they provide. Providing a range of software and hardware catering for visually impaired students studying at the different colleges is necessary for enabling them to access the KSU laboratories, libraries and resources. The KSU laboratories can be equipped with assistive applications, software, and devices geared towards students with special needs. In this respect, Ampratwum, Offei & Ntoaduro (2016) recommended that efforts be made to stock the laboratory with additional computers. More practice time should be created for the students to maximize computer use. Licensed JAWS must be acquired by colleges to advance students' competence in using computer assistive technology since some students are not familiar with JAWS. The university may provide blind students with loans to enable them to buy a Braille Sense Notetaker. Course materials for blind students can be integrated, their electronic courses published, and technical support provided with the help of the Deanship of e-Learning and Distance Learning.

Since smartphones nowadays have many accessible built-in features that help blind users to connect to a refreshable Braille display wirelessly, to post photographs on Facebook, identify colors and money denominations, read bar codes for product usage, and many language apps that the students can benefit from in language learning, blind students can use a combination of a smartphone or tablet and a refreshable Braille display instead of an expensive Braille Notetaker (Hong, 2012; Al-Jarf, 2020a).

The Web Accessibility project at KSU should be activated in all university websites. Blind students' awareness of Web Accessibility can be raised through workshops, seminars, and lectures, and publishing a guidebook on Web Accessibility parameters.

College instructors need to understand how important assistive technology is for visually impaired students and must become skilled at some of its uses.

Furthermore, to help blind and visually impaired students overcome the challenges and benefit from assistive technologies the following factors should be taken into consideration: full commitment from stakeholders, continuous training and improvement, the importance of the classroom environment in facilitating the use of assistive technology, level of instructors' training and their familiarity with assistive technologies, in addition to psychological aspects (Blue, 2013; Tuwaym & Berry, 2018; Theodorou & Meliones, 2020).

Finally, the study recommends that colleges survey blind students frequently to find out how they are coping with technology, to solve their problems with assistive technologies, introduce them to emerging assistive technologies, to evaluate and improve the electronic services provided to students with special needs by the university.

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