Assistive Technology Adoption and Impact on Academic Success: A Case Study of University Library Resources for Students with Disabilities

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Abstract. Assistive technology plays a crucial role in empowering individuals with disabilities, promoting inclusivity, helps bridge the gap between their abilities and the demands of activities in university, enabling them to participate more fully in academic lives. This study aimed to describe students with disability experience in using assistive technology in Universitas Airlangga library. The informants of this study were 8 (eight) undergraduate students with disabilities from various majors in Universitas Airlangga. This case study used descriptive qualitative methods which conduct semi-structured interviews to gain in-depth insights of informants. This study indicates that all informants agreed that assistive technology was very important to help them in accessing digital information and support the success of their studies in university especially helps them to complete their course and final assignments. Informants also need a comfortable and conducive library space as well as assistance from librarians who understand how to serve informants' needs.

Keywords: Assistive Technology Adoption, Academic Success, University Library Resources, Information Access, Physical Access, Students with Disabilities

1 Introduction

Assistive Technology (AT) is often neglected by some users who actually need it. This is based on several factors, such as lack of user motivation to use or operate the device; lack of training on how to use the device specifically for people with disabilities; environmental constraints on use; lack of access to information on repair and maintenance; and the aesthetics of the device, such as weight, size, and appearance. The use of AT for people with disabilities enables a better understanding of how to improve educational opportunities and outcomes for learners with disabilities. Utilizing appropriately designed AT can address some of the social disparities seen in public education while improving our understanding of how to design for greater inclusion. The term AT often means specially designed software and hardware, with many low-tech options ranging from space layouts to pencil grips that make information or learning experiences more accessible to specific users. Often, a lack of understanding of how learners with disabilities experience educational environments at all levels exacerbates their problems and prevents us from recognizing the role of technology in addressing the educational challenges of these students. This points to a real need for improvement in the design and implementation of information technology. There are design and implementation challenges in creating inclusive learning environments, from classrooms to technology, that assume all learning styles and needs are routine. AT can help users by improving their functional abilities in remembering, seeing, hearing, walking, learning, and more [1].

AT is a term that describes software or hardware that assists users. It is applied mostly in reference to technology used by people with disabilities. An example is the use of *software* such as *screen readers* for users with visual disabilities in libraries or information centers. AT helps people perform functions that their disability cannot. Some libraries already have assistive technology for people with disabilities, which can include mobility devices such as walkers and wheelchairs, as well as hardware, software, and peripherals that assist people with disabilities in accessing digital information or other information technology. People with hearing disabilities can use technology that reads text on the screen and converts it to sound; people with *low vision* can use technology that enlarges letters on the computer; people with hearing disabilities can use a *text telephone* (TTY); and people with speech disabilities can use devices that speak aloud as they enter text on the keyboard [2].

The number of people with disabilities in Indonesia in 2020 will be 933,893. Persons with disabilities aged 15–29 years are around 126,789 people. This number has details, namely that persons with disabilities aged 15–19 years are 41,557 people, while persons with disabilities aged 20–24 years are 42,024 people, and persons with disabilities aged 25–29 years are 43,208 people [3]. In 2020, Katadata Insight Center (KIC) conducted a survey on the education level of people with disabilities in Indonesia. Based on the results of the survey, it was found that there is still an education gap for people with disabilities. The proportion of people with disabilities who completed university education was only 2.8%, and that of those who completed high school was 9.85%. People with disabilities who did not graduate from elementary school amounted to 30.54%, and people with disabilities who did not go to school amounted to 21.22%. This shows that the education of people with disabilities is still low [4]

AT has several benefits like it provides easy access to information, enables people with disabilities to conduct research, enhances the learning process, provides opportunities for people with disabilities to acquire ICT skills, and provides opportunities to learn more about disability. Assistive technology provides opportunities for people with disabilities to enhance their learning and provide access to information for personal development. Assistive technology is a powerful tool to support inclusive education for people with disabilities. It enables people with disabilities to overcome traditional barriers, such as mobility and geographical distance, to information. The main challenges people with disabilities face in using assistive technology are inadequate equipment, a lack of skills, and poor maintenance of existing technology [2]. AT enables communication, mobility, and self-care; helps build relationships with families; and enables access to education, health, social services, and employment opportunities. AT is an important tool to unlock learning potential among people with disabilities [5][6].

2 Methods

This case study uses a descriptive qualitative method that conducts semi-structured interviews with students with disabilities and uses observation methods. This method is used as a medium of exploration to add insight into their unique experiences, challenges, and success stories in using assistive technology when accessing information. According to Sugiyono [7], qualitative research methods are methods that examine natural objects with researchers as key instruments in data collection and analysis. This method focuses on understanding the phenomenon under study, such as behavior, actions, views, and motivations. The data collection methods used in this research are semi-structured interviews and observation. A semi-structured interview is a

data collection method using open-ended questions that have been predetermined by giving informants the opportunity to discuss and provide further explanations and responses.

Through observation methods, researchers can describe the activities that take place, the people involved, and the meaning of events that have been seen like observations to study the interactions of students with disabilities with the AT. According to Marshall & Rissman in Haryono [8], observation is a systematic description of events, behaviors, and artifacts in a social setting. This method records a symptom with the help of an instrument and records it for scientific or other purposes. This observation involves all senses, such as hearing, sight, taste, touch, and taste, based on the facts of empirical events.

3 Results and Analysis

Along with the development of inclusive education in the university, Universitas Airlangga's library in liaison with the Airlangga Inclusive Learning (AIL) team initiated the establishment of the Narayana space in 2021. Located in the Campus B library, the Narayana space is a disability-friendly facility equipped with a number of assistive technologies to enable easy access to information for students with disabilities. The Narayana space has several assistive technologies according to the needs of people with disabilities, namely [9]:

1. For people with Low Vision: Universitas Airlangga Library provides technology for low vision students, namely Zoom Magnifier, where this technology makes it easier for people with low vision to read printed collections through object magnification mechanisms.

2. For people with visual impairment: Universitas Airlangga Library provides 3 units of touch screen personal computers equipped with NVDA (Non Visual Desktop Access) software, where this technology makes it easier for people with disabilities to access information sources such as repository, e-journal and internet access to support access to information while studying at Universitas Airlangga.

The Universitas Airlangga's library itself is an accessible building with large entrances and exits which accommodate wheelchairs, guiding blocks, ramps, and toilets for people with disabilities.

3.1 Informants' Characteristics

Informants of this study consist of eight students with disabilities in Universitas Airlangga, who have used the facilities provided in the Narayana space in the university library. Four informants had visual disability (low vision or blindness), and four other students had physical disability. The details of the informants are described in Table 1.

Table 1. Characteristics of informants

Characteristics	N (%)
Gender	
Male	4 (50%)
Female	4 (50%)
Level of study	
Bachelor (S1)	2 (25%)
Master (S2)	3 (37,5%)
Doctoral (S3)	3 (37,5%)
Area of study	
Social and Political Sciences	5 (62,5%)
Business and economics	1 (12,5%)
Cultural Studies	2 (62,5%)
Types of disability	
Visual disability	4 (50%)
Physical disability	4 (50%)

3.2 The Use of Assistive Technology by Students with Disabilities

The experiences of students with disabilities in using assistive technology are closely aligned with their special need conditions. Some adaptations are made so that people with disabilities also have the opportunity to use the technology (adaptive technology) for example, individuals who are unable to use the computer keyboard manually, can access the computer through alternative inputs so that the computer can be accessed by all individuals regardless of their disabilities[10].

As, P02, explained that based on her experience during her study at the university:

> *"I am more comfortable when, for example, the lecturer explains then I respond with, for example, a cell phone, laptop or tab. Basically, electronic items make it easier for me, for example, to minimize writing" (P02)*

Related to this, another student with cerebral palsy added that:

> *"The computer used in the Narayana space has touchscreen technology, which makes it very easy for me to operate the computer, where the mouse is often on the right." (P07)*

Meanwhile, students with a visual disability, such as P01 and P05, described the importance of the screen reader feature to help them in accessing information. P01 explained:

> *"NVDA is very vital for friends who are totally blind. If I have low vision, I can still use the magnifying glass feature in Windows. The built-in Windows software can already use a magnifier, so there are no problems." (P01)*

Referring to the literature, Tripathi and Shukla (2014)[11], in their study on the use of assistive technology in libraries, acknowledged the importance of enlarging or magnifying software and screen reading software to meet the needs of students with visual disability. People with total

visual impairment usually rely on screen readers or software that translates the contents of a computer or cell phone screen into speech output or Braille display. Screen readers usually include JAWS for Windows, Window-Eyes and Refreshable Braille Displays. A person with visual impairment can benefit from simple compensations such as magnifiers, glare reducers, bright lighting, high-contrast coloring and larger fonts. Whereas, someone who has severe low vision may require the use of a screen magnifier, and sometimes these magnifiers are used in conjunction with a screen reader. People with visual disabilities can also increase the size of fonts and system images to avoid the need for screen magnifiers [2].

In relation to screen reader facility, P01 pointed out the importance of the availability of sufficient digital resources which support the use of screen reader:

> *"So, we [people with visual disabilities] need a digital version, because each of us already has a screen reader, already has a tool for reading ... So maybe there are digital versions of some textbooks that are used as references by the campus. If there are textbooks in economics, the big names in economics seem to have to have digital versions. And it's legal, so it doesn't violate copyright." (P01)*

AT is used to support students with reading and writing disabilities, as well as other disabilities. AT reading skills, app usage, and motivation for reading and schoolwork. The use of AT has a positive impact on the motivation and independence of people with disabilities. AT in the context of tablets, smartphones, and computers and accompanying software works well, especially for students with severe reading and writing difficulties. AT serves as a support for reading and schoolwork [12].

Some other facilities which students think should be added include headphones and loudspeakers, although in general, they think the facilities have been quite complete.

> *"But I think that in terms of facilities it looks like this needs to be added, maybe headphones, for example, if we are studying there, there are several people who may be disturbed by online lectures, so I think maybe headphones need to be provided on several computers." (P04)*

3.3 The Importance of Accessibility and Support
The availability of guiding blocks around the library building, especially the Narayana space, has been viewed as beneficial by students with visual disabilities, such as P01 and P03. Informant P04 also described that he thinks the position of the library is good:

> *"For me, if you ask me if [the facility] is important, it's very important. Even now, the position [of the library] is very strategic. Actually, it's not that difficult for you, what's important is whether you have the enthusiasm to go there often." (P04)*

However, there are still some issues to be solved to enhance the physical accessibility around the building, including adjusting the height of the guiding blocks, and assisting to access the library building from outside of the campus, as stated below:

> *"... there is a minus too, from the past until now the traffic has not been accommodated, what is that called, the blocks on that floor are still quite high, so I often stumble there. Yes, it's meant to show the way, but for example, I've never stumbled across other places, but [the one in the library] is quite high. The guiding blocks are white, silver. But so far Narayana is very good, when I tried it with P03, it would definitely be very useful for my blind friends, I'm sure. But the distance from her boarding house [P03] to campus, for example if she has low vision, has to cross the road, afraid of getting hit, yes, that's quite a challenge. Even though university is a challenge to go through, if it's easier it's better. ... There is no access assistance from the parking lot to the entrance"* (P01)

Sometimes, finding things in the library may also be a challenge, especially for those with mobility issues, as described by P04:

> *"Yes, if we talk about experience, I think I've also had very helpful experiences, there were some [resources] that could be accessed using VPN outside, outside of campus, and there were also some that can be read on campus, which really helped me too. It's just that yesterday there was a reference that I had to look for, it turned out it wasn't available in the library, then I tried checking in the admin, it turned out it was in the faculty, so hopefully, maybe only one or two are like that, hopefully in the future there will be several theses or dissertations which is not just [available] in the faculty."* (P04)

A detailed user guide is recommended by the students:

> *"If it's important, of course we all admit it's very important. It cannot be denied that technology has really helped us. We cannot deny that. But yes, like accessibility, the user guide may need to be improved in that area so that something important becomes more accessible for everyone. It's not funny if this is important, but other people who need it can't use it"* (P01)

> *"Perhaps a user guide could be added. So maybe it could be added for friends with disabilities, maybe put the user guide in the Q&A, maybe the help desk could be added, the numbers included and so on. Maybe like that, to make it easier for friends, you can read it on the website, on the page, you can go directly, oh, if you have disabled friends, you can contact this PIC, if there are any problems and so on."* (P03)

For some students, having a close relative who may support them to access the library facilities has been found beneficial. However, other students may rely on the support from library staffs or university volunteers, as they say:

> *"I also often visit Narayana, but thank God I have some help, I don't need to be [assisted by] a student [volunteer], thank God, I have a family with my own wife. ... So, I think that's all we need to follow up on. I think if it had been followed up, it would seem that the various shortcomings of those friends could be resolved."* (P04)

"The point is more about accessibility or ease of access. And before, for example, talking about IT, accessibility is more necessary. We also need humans; we need human resources." (P01)

"This means that human resource here are people who are willing to pick up the ball. It means helping us, making it easier for us when, for example, we want to access the library. And what this also means is understanding our disabilities or our obstacles. Because disabilities are diverse and the obstacles must be different. And there also needs to be training so that they also know about this." (P02)

"Yesterday, when I wanted to upload what was on my list, well, maybe this could be a consideration or maybe something like that will happen in the future, because I actually turned on my magnifier when I uploaded it, because there was a lot of writing. details like that, right, what to include, what to write, sometimes I have this, it's like I lost control of my mouse and then pressed it and I was in a hurry to submit [the documents]. ... Well, maybe in the future Narayana will be able to help, for example if friends want to ... [get] help with their uploads, maybe staff will be provided who can help at the library, maybe it will make things easier. So, friends who are like me, who have a bit of difficulty navigating laptops and so on, maybe they can get help when they go to campus, then help them later, oh yeah, I'll upload it later, or later with them along or something." (P03)

For disabilities who require assistance in the process of accessing information, it is necessary to provide librarians who accompany them. specifically and intensely for disabilities so that the fulfillment of information needs can be done optimally. information needs can be done optimally. Librarians must understand characteristics of each disability that is a user of the services provided because the characters and needs of each disability services provided because the characters and needs between one disability and another are different according to their respective conditions. differ according to their respective conditions [10].

3.4 Student Perceptions on The Benefits of Narayana Space

All informants of this study appreciated the presence of the Narayana space in the Campus B library. The existing facilities are considered complete and useful. A number of facilities that informants have accessed during their visits to the library are computers in the Narayana space which are equipped with NVDA, zoom magnifier, as well as e-book, e-journal, OpenVPN and AILIS facilities.

"Then in the library, to be honest, I also appreciate it very much, there is an etiquette from UNAIR for extraordinary etiquette, which is very good, for providing facilities such as, what is it called, book readers and so on." (P01)

In regards to the existing facilities, P08, an undergraduate student with a visual disability, said that "the space is very conducive, calm, and has complete facilities." In line with this, P05, a master's student with a visual disability, explained that having up to date devices, good technology and a conducive space are the driving factors for students with disabilities to make the most of the assistive technology provided.

The result of this study indicates that the availability of the assistive technologies may help students with disabilities to access information and data required to complete their course and final assignments. As highlighted by Ramgil and Patil (2023)[13], "access to information is a human right" and assistive technology provides a way for people with disabilities to access information. Some of the informants of this study described:

> "Assistive technology helps me research the topic of an assignment through credible reference sources. Assistive technology (also) makes it easier for me to access journals and related references that I need." (P08)

> "With the help of a fast internet connection, it is easy to find information and data." (P04)

> "Honestly, I just feel [the benefit of] the collection the most. So, when it comes to using Narayana's facilities, I rarely use them. But I feel the book collection is complete. But I used to really struggle before there was Narayana. I use my cell phone, I order one by one, and I scan. So, it's more manual. I am sure that the features provided by Narayana will definitely be very useful for friends in the future." (P01)

Furthermore, the informant described that the availability of assistive technology played a significant role in supporting their study. One informant, P05, stated that assistive technology had become part of his daily life, because he never performed a course assigment without using assistive technology. The following is the statement of P07 regarding differences in accessing information, before and after using assistive technology "It is easier because the computers in the Narayana space are touch screens".

McNicholl, et al. (2021)[14], in their systematic review on the impact of assistive technology use for students with disabilities in higher education, stated that assistive technology supported students with disabilities in completing course assigment more easily and efficiently. The use of assistive technology has also been linked to increased performance of academic tasks, such as reading, writing, note taking, etc. Two informants stated that the presence of assistive technology facilities in the library also enhanced their independence in studying and working on assignments, as follow:

> "Like the earth and sky. Without assistive technology, I always have to bother other people or volunteers." (P01)

> "Of course, it is very different. Before getting to know assistive technology, I would more or less depend on human assistance to read. Assistive technology greatly reduces that dependence." (P08)

These results are also in line with those of McNicholl, et al. (2021)[14], which found that the use of assistive technology may facilitate positive psychological change for students with disabilities. These students may feel more motivated, autonomous, and confident on account of assistive technology use. In general, the students stated that they were satisfied with the existing assistive technology, because it suited their needs and they felt that it helped and made it easier for them to learn. The eight informants also agreed that assistive technology was very useful in

supporting the success of their studies in university. Improved education access and opportunities also impact on the lives of people with disabilities after school and employment. AT increases opportunities for people with disabilities to work. AT also increases the independence of people with disabilities and enables people with disabilities to perform activities without the help of others. This will also impact on the quality of life of people with disabilities [15]. As added by P01:

> *"I'm sure, it will definitely be useful if it is useful for people who are... Shy, perhaps embarrassed to always be accompanied or want to be independent, have a high spirit of independence, they will definitely be greatly helped by the tools available at Narayana." (P01)*

In addition to supporting academic learning, a student with cerebral palsy explained the support she got from Narayana in uploading the documents for graduation, which she felt happy with:

> *"In my personal experience it was quite difficult because it turned out that the document was quite detailed and the writing at that time was quite small while at that time, I needed it quickly. I thought maybe with a cell phone it would be possible as long as the file had been saved but it turned out because it was important [you need to] read more carefully so you have to use a laptop and personally I have quite difficulty with this motoric barrier. Thank God, the librarian and the team at that time were quite helpful, so I felt really helped. But for example, if you don't have a contact person from your friends or a team of librarians, especially when you're still online outside the city, it's definitely going to be difficult. ... if you're offline, you just have to come to campus and go to the library." (P02)*

According to that condition, the use of AT aims to promote, maintain, and provide assistance to students with special needs in order to overcome obstacles due to both physical and socio-cultural limitations. This also applies to the field of education, where AT is instrumental in the realization of inclusive education. AT has great potential in providing access to education for students with disabilities to continue participating in education. The use of AT in inclusive education acts as a bridge to provide technological support for students with disabilities to learn alongside normal students. This has an impact on the participation of students with disabilities in continuing their education, which will also have an impact on their life after school [16].

3.5 Student Expectations of University Facilities to Support Inclusion

Most informants of this study did not seem to visit the Narayana space very often. Three of them had only used the facilities once, while the rest stated that they had used the facilities several times. This is understandable because the Narayana space was first introduced during the Covid-19 pandemic when lectures were still running online and there were still restrictions on attendance on campus. In the future, the university should put more effort into disseminating information about the existing services, so students with disabilities in Universitas Airlangga may fully benefit from these resources to support their learning. In addition to dissemination about the services provided by the library, general information sessions to support disability awareness are also deemed important.

"It seems that socialization needs to be maximized so that many friends with disabilities know, especially perhaps new students who have disabilities, meaning from bachelor's degree, like that. And maybe the socialization should be made a bit interesting so that students are also more interested." (P02)

"Information from the beginning, or there is a contact person. So, the contact person who is on standby is probably for anyone who wants to ask questions about the facilities, then the benefits ... Customer service for friends with disabilities. If I need this or that, who should I go to, where do I go, what time does it open, for example like that, what are the conditions? So, maybe there is some kind of contact person to organize information, act as a bridge and provide education on the various facilities that have been prepared. It's not funny if there are lots of facilities, investment is big, but communication is lacking, marketing is lacking, so utilization is not optimal." (P01)

In relation to human resource support, the students suggest that the role of AIL student volunteers can be optimized.

"I want that in the future, AIL will be even more optimal in its volunteer recruitment system. That's why I think it's very important. Especially regarding, for example, training, how disability inclusive development can be implemented optimally. Because I am sure that in the future UNAIR, as one of the largest and most prominent campuses, there will definitely be many more students with special needs who will study at this university, so the need for volunteers will also be very important regardless of the needs, for example in terms of assistive technology or good technology, for example, related to books or other tools." (P02)

"When I heard the complaints earlier, actually I don't know whether my friends here were invited yesterday to join the training to assist students with disabilities, which was held if I'm not mistaken in September. I think this should be followed up again, because students are registering to become disability companions. I just tried to follow the progress; it doesn't seem very active. And actually, there are some disadvantages to accompanying students with disabilities because there is a lack of human resources among students, most of those who register are female students. ... I think the mutualistic symbiosis can be activated, students will be given several credits to be recognized, and we are also helped quite a bit like before, there is no access assistance from the parking lot to the entrance." (P04)

4 Conclusion

All informants of this study (eight informants) appreciated the presence of the Narayana room in the Campus B Universitas Airlangga library. They considered the existing assistive technology as facilities to access information are useful such as computers which are equipped with NVDA, zoom magnifier, e-book, e-journal, OpenVPN and AILIS facilities. They also described that the availability of assistive technology played a significant role in supporting

their study so that they are able to be independent in reading, writing, note taking, etc which certainly has an impact on completing course assignments more easily and efficiently. On the other side, assistive technology may facilitate positive psychological change for informants, where they feel more motivated, autonomous, and confident in carrying out college activities by utilizing assistive technology. Beside improving the success in education, utilization of assistive technology gives informants diverse life opportunities such as obtaining abundant information and knowledge, getting a decent job and actively participating in society.

Disabilities conditions are diverse then the obstacles must be different. Sometimes finding information resources and using library facilities become a challenge for students with disabilities. Informants usually need support from close relatives, or librarians and also from Airlangga student volunteers (Airlangga Inclusion Learning Unit). In facing these challenges beside having people support, informants suggest the library provide a detailed user guide, and disseminate information about the existing services provided by the library. General information sessions to support disability awareness are also deemed important so all students in Universitas Airlangga may fully benefit from these resources to support their learning.

References

[1]   Ayon, V. and Dillon, A., "Assistive Technology in Education," *Int. J. Information, Divers. Incl.*, vol. 5, no. 3, Sep. 2021, doi: 10.33137/ijidi.v5i3.36136.

[2]   Robert, B., "The adoption of assistive technologies in academic libraries : a case study of library users with visual and hearing impairment at Kyambogo University in Uganda," in *The adoption of assistive technologies in academic libraries : a case study of library users with visual and hearing impairment at Kyambogo University in Uganda.*, 2012, pp. 1–6.

[3]   BPS, "Penduduk Indonesia Hasil Long Form Sensus Penduduk 2020. In Sensus Penduduk 2020 (Vol. 17, Issue August)," 2023. [Online]. Available: https://www.bps.go.id/id/publication/2023/07/18/4a49f846d0708c1fe1117b5f/penduduk-indonesia-hasil-long-form-sensus-penduduk-2020.html

[4]   Dwi Hadya, J, "Hanya 2,8% Penyandang Disabilitas Menamatkan Perguruan Tinggi," 2020. https://databoks.katadata.co.id/datapublish/2020/02/07/hanya-28-penyandang-disabilitas-menamatkan-perguruan-tinggi

[5]   Kintsch, A. and Depaula, R., "A Framework for the Adoption of Assistive Technology," *Lifelong Learn.*, vol. 3, pp. 1–11, 2002, [Online]. Available: http://l3d.cs.colorado.edu/clever/assets/pdf/ak-SWAAAC02.pdf

[6]   UNICEF, "Framework for building capacity for assistive technology and alternative augmentative communication," 2023.

[7]   Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alphabet, 2019.

[8]   Cosmas, H. G., *Ragam Metode Penelitian Kualitatif Komunikasi*. CV JEJAK (JEJAK PUBLISHER), 2020.

[9]   UNAIR, "Universitas Airlangga Library," 2023. https://lib.unair.ac.id

[10]   Mutia, F., *Akses, Informasi Dan Disabililtas*. Penerbit Airlangga Press, 2023.

[11]   Tripathi, M. and Shukla, A., "Use of assistive technologies in academic libraries: A survey," *Assist. Technol.*, vol. 26, no. 2, pp. 105–118, 2014, doi: 10.1080/10400435.2013.853329.

[12]   Svensson, I., *et al.*, "Effects of assistive technology for students with reading and writing

disabilities," *Disabil. Rehabil. Assist. Technol.*, vol. 16, no. 2, pp. 196–208, Feb. 2021, doi: 10.1080/17483107.2019.1646821.

[13]   Ramgir, V. N. and Patil, H. J., "Assistive Technologies in Libraries for Visually Impaired Users," *Digit. Transform. Libr. Inf. Centres*, no. July, pp. 227–240, 2023, [Online]. Available: https://www.ttpp.in/book-info/digital-transformation-in-libraries-and-information-centres

[14]   McNicholl, A., Casey, H., Desmond, D., and Gallagher, P., "The impact of assistive technology use for students with disabilities in higher education: a systematic review," *Disabil. Rehabil. Assist. Technol.*, vol. 16, no. 2, pp. 130–143, 2021, doi: 10.1080/17483107.2019.1642395.

[15]   Stumbo, N. J., Martin, J. K., and Hedrick, B. N., "Assistive technology: Impact on education, employment, and independence of individuals with physical disabilities," *J. Vocat. Rehabil.*, vol. 30, no. 2, pp. 99–110, 2009, doi: 10.3233/JVR-2009-0456.

[16]   Suwahyo, B. W., Setyosari, P., and Praherdiono, H., "Pemanfaatan Teknologi Asistif dalam Pendidikan Inklusif," *Edcomtech Junal Kaji. Teknol. Pendidik.*, vol. 7, no. 1, pp. 1–63, 2022.