

USE OF ASSISTIVE TECHNOLOGIES IN THE LIBRARY BY PERSONS WITH DISABILITIES: A PATRON PERSPECTIVES SURVEY

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This research study aims to identify assistive tools for persons with disabilities and the satisfaction with information services provided by the libraries of the Indian Institutes of Technology (IIT). Students from the top ten IITs (Indian Institutes of Technology) were targeted for this survey research study. The students were enrolled in undergraduate, postgraduate, and doctoral programs. A semi-structured questionnaire was designed in the print and web formats to seek their opinions on assistive technologies. A snowball sampling technique was used to collect data from the students with disabilities. A total of 217 samples were collected and tabulated into graphs and charts. The respondents gave a positive feedback on the services and infrastructure provided by the IIT libraries to persons with disabilities. They were satisfied with the assistive tools and outreach but needed more training on the use of emerging technologies and services. They made a heavy use of laptops and mobile devices to access library resources and services. They were somehow dependent on the library and emphasized that library staff should be trained in helping and assisting students with disabilities. Many research studies have been conducted globally and in India. This research study was conducted in one of the premier institutions of India. The research findings are pretty insightful on the feedback of persons with disabilities on the library services. The findings would be helpful for policymakers and librarians who wish to design a lab for or provide services to persons with disabilities.

Keywords: Persons with Disabilities, Assistive Technologies, Inclusive Services, Inclusive Library, Information Services, Library Services, Special Services, IIT Libraries

INTRODUCTION

It is the duty of the library to treat every person equally, and libraries all around the world have been trying their best to create an inclusive and welcoming environment for students, including those with disabilities. Jaeger (2018) discusses in great detail how libraries have fought for the rights of the marginalized that include people with disabilities. The author begins his study by giving a brief background on how people with disabilities

have been ill-treated historically and how the trend continues even today. Libraries, however, have for long opened their doors to people with disabilities and include them as members of the community. Several programs encourage education, participation, and empowerment of people with disabilities. The author states that libraries were the first institution to advocate against the dehumanization of people with disabilities. Starting from 1835, lending services began to be made available to persons with disabilities throughout New England, and the creation of material in Braille began as far back as in 1868. There were other developments like opening up of the reading room of the Library of Congress for the blind in 1897. In the 1920s, patrons with disabilities were introduced to Talking Books as well as talking book machines (Cylke, Moodie & Fistick, 2007). The founding of the first American Library Association committee that provided services to people with disabilities was the first step towards easing the struggle of people with disabilities. In 1961, the ALA crafted standards to provide equal services to all people, including those with disabilities.

Information has become an essential commodity in the digital age to gain knowledge in education, research, and cultural development. Hence, it is vital to provide information to the disabled people because there is significantly less consideration for them in our society and community. ICT plays a vital role in facilitating access to online resources and study materials for the differently-abled people for educational purposes. There are many assistive technologies,

such as JAWS, screen readers, speech synthesizers, listening aids, and many more, for use by the differently-abled people (Ekwelem, 2013). Nevertheless, when it comes to the library, they face challenges because of the unavailability of assistive technologies and of resources in alternative formats. Consequently, they are unable to access information resources and facilities the way ordinary people do, and do not get up-to-date information in accessible formats. Other challenges include limited funding, lack of staff awareness and training, and lack of a decision-making body at the library level.

The library is a traditional institution where all kinds of people come to access materials for educational purposes. “An academic library is a spiritual home to support users in their pursuit of lifelong learning (Bodaghi, Cheong, Zainab and Riahikia, 2017).” The IFLA guidelines provide physical access to differently-abled people to access the library buildings, stairs, toilets, restrooms, elevators, and restrooms. Reading materials are available to the differently-abled people in formats like Braille books, talking books, talking newspapers, videos/ DVD books with subtitles, e-books, sign languages, tactile picture books, etc. However, the library professionals and staff often provide library services and facilities in inappropriate formats to the differently-abled users (Irvall et al., 2005). The library has a central role in providing services to persons with disabilities and strengthening their education and research skills (Lessy, Kailani and Jahidin, 2021).

The Oxford Dictionary describes a disability as “a physical or mental condition that means you cannot use a part of your body completely or easily, or that you cannot learn easily.” Incapacity impacts a person’s activities and may happen at birth. The WHO (World Health Organization) defines disability as “an umbrella term, covering impairments, activity limitations, and participation restrictions.” The Government of India’s Rights of Persons with Disabilities Act, 2016, specifies 21 types of disabilities. It states that every disabled child 8-16 years old has the right to get free education in primary schools. The Act directs the Government of India to provide 4 per cent reservation in government jobs and reserve five per cent of seats in higher education for the differently-abled people (Government of India, 2016).

REVIEW OF LITERATURE

The researchers did a literature survey before designing and framing the research questions. A vast number of published resources are available on disability. Several country-specific studies have been conducted that focus on libraries that provide accessible resources and assistive technology to people with disabilities. A study by Ahmed and Naveed (2020) discussed information accessibility for visually-challenged students in institutes in Pakistan, specifically Lahore. They found that Internet was used by more than half of the participants to search for audiobooks, articles, and videos pertinent to their syllabus. Not many students used the library due to the lack of specialized services. It was noted that participants

selected sources based on their comfort and field of study. Students with low vision preferred facilities like Zoom texts, magnifiers, audios, and large prints. On the contrary, blind students preferred using e-resources readable via JAWS and Braille. The second research question sought to answer the challenges faced by students.

Eneya et al. (2020) recommended that institutions must formulate regulations to enforce the implementation of the disability policy and legislation and design institutional disability guidelines so persons with disabilities can access information library services and facilities in their institutions and libraries (Eneya et al., 2020). Differently-abled users face challenges in accessing the infrastructure of buildings, computer laboratories, Internet, and assistive technology at the Jordan University and other institutions and colleges of Jordan. There is a lack of financial budget, awareness of assistive technology, and training programs for library professionals and staff to provide library information services and facilities to their users (Alsalem & Doush, 2018). Chiang et al. (2020) investigated augmented reality application 3D reference tools in the research study. These 3D application tools are used to search through and navigate online library catalogues by low-vision and elderly users in the library. Older people can search online books, video lists, and library maps to scan the quick response (QR) code through a mobile device at the Ling Tung University. This application saves time and allows for quickly searching through and navigating the online library catalogue.

One particular research study's primary purpose was to highlight how government and non-government organizations provide information services and facilities to the differently-abled people in the libraries and information centres of Midnapur district of West Bengal in India. The researcher found that differently-abled people had no opportunities to access information in the village areas due to a lack of dissemination of information by the government and non-government organizations (Das, 2017). Some studies have found that assistive technologies provided by libraries to differently-abled persons are underutilized because access to those technologies might not always lead to use (Bashir et al., 2017; Sanaman and Kumar, 2015).

Potnis and Mallary proposed an "information value chain" for improving information services to persons with disabilities using assistive technologies in academic and research libraries (Potnis and Mallary, 2021a). The adaptive technology program can be implemented to increase awareness among library patrons with disabilities. Timony (2015) remarked that providing innovative technology support like maker space and 3D printing, offering training, and organizing innovative events would help patrons with disabilities. Graves and German (2018) recommended adopting programmatic disability inclusion on library websites.

Sanaman and Kumar (2015) explored the views of people with disabilities regarding assistive technologies available in India. They found that users had a fair understanding of the assistive technology concepts and products. A

study conducted by Bashir et al. (2017) in public and private sector universities of Lahore, Punjab province, found that the libraries did not provide telecommunication devices and other advanced tools to differently-abled persons. Kaunda and Chizwina (2019) found that the North-West University (NWU) in South Africa had limitations in terms of material and assistive technologies in the libraries.

Boot et al. (2018) did a systematic literature review of 22 key studies. They identified 77 barriers and 56 facilitators and found that the most frequent barriers were lack of funding and cost of assistive technology. Potnis and Mallary (2021b) identified 51 challenges related to the knowledge and skills of librarians when serving differently-abled patrons with assistive technology. Specific skills and competencies are required to provide better services to differently-abled users (Munyoro, Machimbidza and Mutula, 2021). Mulliken (2017) found that users were appreciative of library services and support on the whole, but they expected more from the library in terms of innovative tools, technology, and training.

The researchers attempted to find out the recent study conducted in different countries, which were retrieved from various full-text and bibliographic databases like Google Scholar, Web of Science, Scopus, Dimensions etc. While many studies have been conducted in other countries, few have been done in India. In their papers, a few Indian researchers have reported on the services available in the Indian libraries for the differently-abled users. However, there is no recent research

study on the library and information services for the differently-abled users in the Indian Institutes of Technologies (IITs).

RESEARCH QUESTIONS

The following are the research questions framed for this study:

- Q1. How much are students with disabilities aware of tools and services available to them?
- Q2. What assistive technologies and library services are frequently used by students with disabilities?
- Q3. For what purpose do students with disabilities use the Internet, and what is the role of the Internet in improving their academic and research work?
- Q4. How much are students with disabilities satisfied with the information services available in their library?

METHODOLOGY

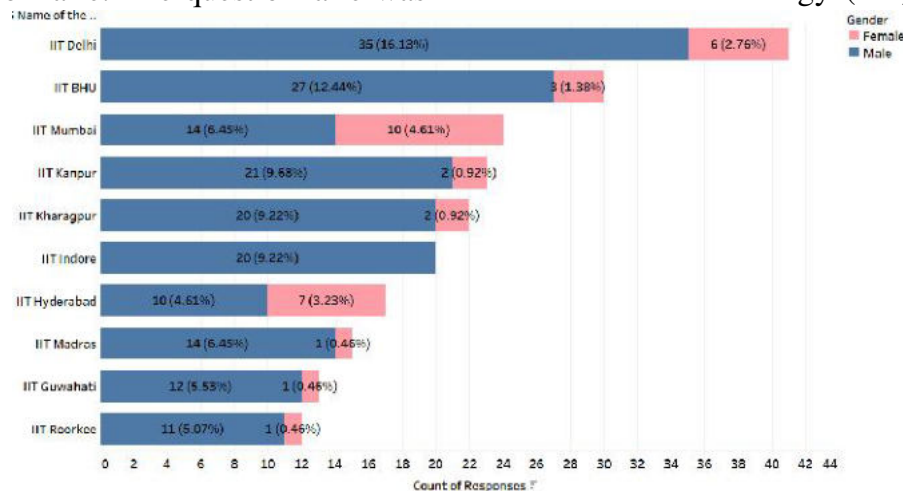
The survey method was used to get insights into the library services provided by the 10 Indian Institutes of Technology. Researchers framed research questions after an extensive literature review. A preliminary study was also conducted to test the questionnaire. The questionnaire was

designed in both print and web formats. A snowball sampling technique was used to collect samples from the respondents because collecting data from the scattered population was challenging. The researchers obtained responses from each institution and made the samples representative. One or two persons from each institution were contacted and then selected as the contact point at the given institution. The contact person distributed the questionnaire among his/her known group of persons with disabilities or differently-abled persons. The pilot testing of the questionnaire was done with the print questionnaire. The testing helped improve the questionnaire as the participants gave many suggestions. Many respondents provided better responses to the print questionnaires than to web questionnaires. There were some missing pieces of information in the response and the feedback, but the respondents were followed up for clarification. A total of 217 samples were collected over a period of 18 months from students studying in the IITs.

RESULTS AND FINDINGS

Respondents' profile

The population surveyed was from 10 Indian Institutes of Technology (IIT). A total of 217



responses were received from students and research scholars. Most of the responses (18.89%), were received from IIT Delhi, followed by IIT BHU (13.82%). Responses received from IIT Mumbai (24), IIT Kanpur (22), and IIT Kharagpur (20) were almost equal in number. IIT Indore (20), IIT Hyderabad (17), IIT Madras (15), and IIT Guwahati (13) were next in terms of responses received. The lowest number of responses (12 in all or 5.53%) were received from IIT Roorkee.

Figure 1 shows that most of the responses (a total of 184 or 84.79%) were received from males, whereas only 33 responses (15.21%) were received from females. The respondents were divided into three categories in terms of qualifications, that is, PhD, postgraduate, and undergraduate. As many as 94.12% of male respondents were doing a PhD, whereas only 5.58% of female respondents were studying for a PhD. Among the respondents enrolled in a postgraduate program, 83.37% were males, while only 16.13% were females. In the case of undergraduate respondents, 84.06% were males, and 15.94% were females.

Table 1 shows the respondents' age and gender. In the age group of 20-25 years, 39.63% of respondents were male, and 5.99% were female. In the second age group (26-30 years), 29.03% of respondents were male, and 5.99% were female. In the age group of 31-35 years, 11.52% of respondents were male, and 3.23% were female. In the last category, that is, age group of 36-40 years, 4.61% of respondents were male, while there were no female respondents.

In 2015, 4.15% of male respondents were enrolled in IITs, whereas no female respondents were enrolled in that year. In 2016, 15.67% of male and 1.38% of female respondents were enrolled. We can see that in that year, enrolment increased by 11.52% and that females were also enrolled. In 2017, 7.37% of male respondents and 2.76% of female respondents were enrolled. Compared to 2016, enrolment of male students in 2017 decreased by 8.3%, whereas that of female students increased by 1.38% and was double the previous year's enrolment. In 2018, the enrolment of male and female respondents stood at 27.19% and 4.61% respectively. That year, student enrolment was higher compared with all the three previous years. In 2019, 23.96% of male respondents and 5.53% of female respondents were enrolled in IITs. The enrolment of male respondents in that year was less in comparison to the year 2018, whereas the enrolment of female respondents was higher by 0.92%. In 2020, 6.45% of male respondents and 0.92% of female respondents were enrolled in IITs, and the overall student enrolment was the lowest compared to the previous four years.

The respondents were students with disabilities doing graduation, postgraduation, and doctoral research. The first disability included in the study was locomotor disability, which means problem in moving from one place to another. A total of 28.57% of respondents had a locomotor disability. The second disability was speech impairment. The name itself says that it is a communication disorder. 19.35% of respondents were suffering from speech impairment disorder. The third disability was hearing impairment, which

means total or a significant loss of hearing or deafness. 16.59% of respondents had a hearing impairment. The fourth disability was visual impairment, that is, partial or complete loss of vision. 15.21% of respondents had visual impairment. The next disorder was learning disability, which is a neurological condition in which the ability of the brain is affected because of which the brain is not able to send, receive, or process the information correctly. 11.06% of respondents were suffering from learning disabilities. The last disorder was multiple disorder, which results in nerve damage and disrupts communication between the brain and the body. 9.22% of students were suffering from multiple disorder.

Opinion on the distance between classroom and library

Table 1 shows the time spent by the users in the library. Eight male respondents spent one hour in the library, of whom four were from the age

group of 20-25 years and two each were from the age groups of 31-35 years and 36-40 years. Out of 16 respondents who spent two hours in the library, 12 were males and four females. Of them, 10 were in the age group of 20-25 years, and six in the age group of 26-30 years. A total of 44 respondents (36 males and eight females) spent three hours in the library. 16 of them were in the age group of 20-25 years, 20 were in the age group of 26-30 years, and 8 were in the age group of 31-35 years. A total of 43 respondents (36 males and seven females) spent four hours in the library. Among them, 11 were in the age group of 20-25 years, 22 were in the age group 26-30 years, six were in the age group of 31-35 years, and four were in the age group of 36-40 years. As many as 106 respondents (92 males and 14 females) spent more than four hours in the library, of whom 58 were in the age group of 20-25 years, 28 were in the age group of 26-30 years, 16 were in the age group of 31-35 years, and four were in the age group of 36-40 years.

Table 1: Time spent by the users in the library

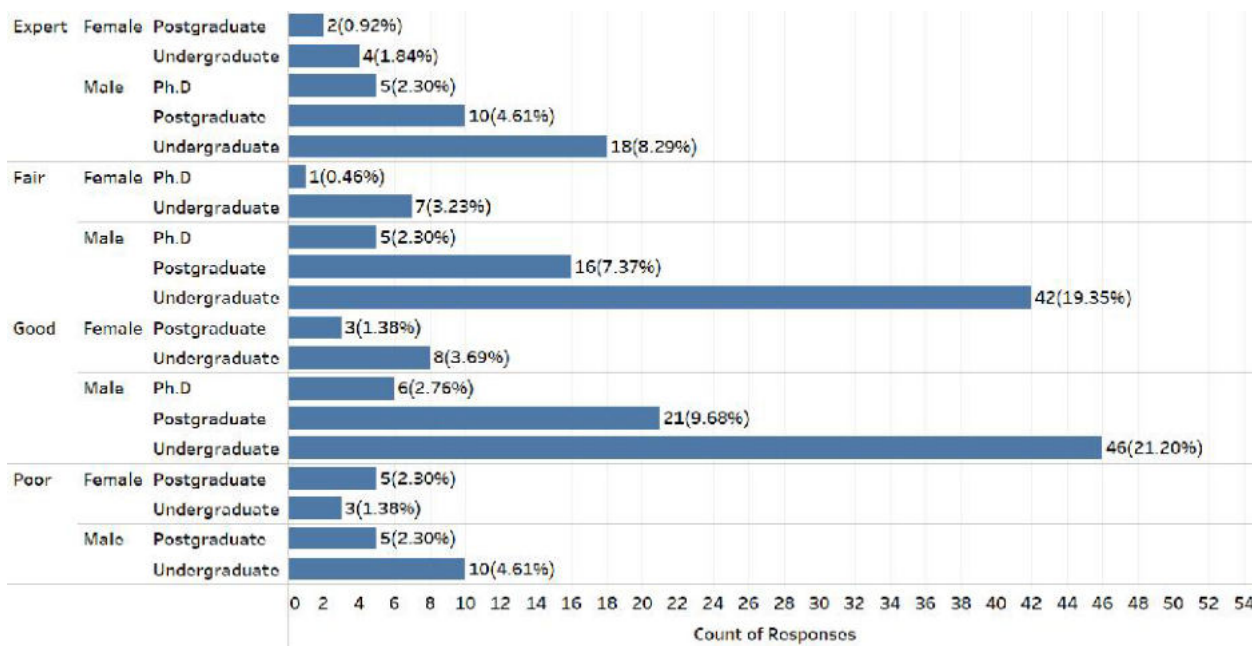
How many hours do you spend in the library?	Gender	Age 20-25	Age 26-30	Age 31-35	Age 36-40	Grand Total
1 hour	Male	4(50%)	0	2(25%)	2(25%)	8(100%)
2 hours	Female	4(100%)	0	0	0	4(100%)
	Male	6(50%)	6(50%)	0	0	12(100%)
3 hours	Female	4(50%)	3(37.50%)	1(12.50%)	0	8(100%)
	Male	12(33.33%)	17(47.22%)	7(19.44%)	0	36(100%)
4 hours	Female	0	3(42.86%)	4(57.14%)	0	7(100%)
	Male	11(30.56%)	19(52.78%)	2(5.56%)	4(11.11%)	36(100%)
More than 4 hours	Female	5(35.71%)	7(50%)	2(14.29%)	0	14(100%)
	Male	53(57.61%)	21(22.83%)	14(15.22%)	4(4.35%)	92(100%)
Grand Total	Total	99(45.62%)	76(35.02%)	32(14.75%)	10(4.61%)	217(100%)

Proficiency in computer skills

Computer skills have become essential in the digital age. Students were asked to describe their competency level on a five-point Likert scale. Figure 2 shows the respondents' proficiency in computer skills. 33 males and six females claimed that they were experts in computer skills. 73

males and 11 females claimed that they were good at computer skills. 63 males and eight females claimed being fairly good in computer skills. 15 males and eight females claimed being poor in computer skills. Overall, the students responded that they were good at computer skills. The undergraduates were more proficient in computer skills than postgraduate and doctoral students.

Figure 2: Respondents' proficiency in computer skills

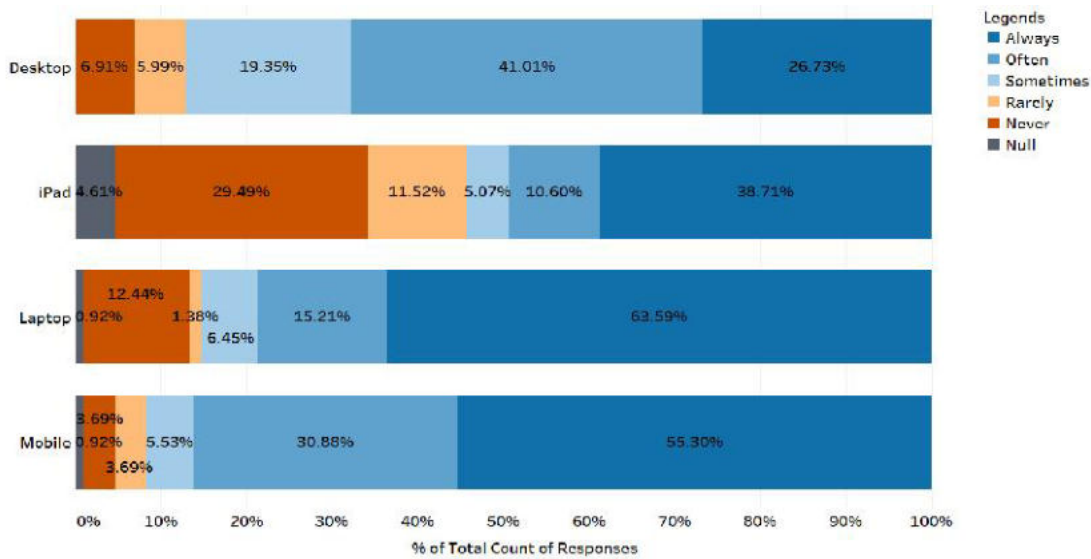


Use of devices to access the Internet

Students use various devices to access the Internet. It was essential to know their preferences. Figure 3 shows the students' frequency of use of devices to access the Internet. Laptop usage was as follows: 63.59% of students always used it, 15.21% used it often, 6.45% used it sometimes, and 1.38% used it rarely. Mobile usage was as follows: 55.03% of students always used it, 30.88% used it often, 5.53% used it sometimes, and 3.69% rarely used it. The desktop

usage was as follows: 26.73% of students always used it, 41.01% used it often, 19.35% used it sometimes, and 5.99% used it only rarely. iPad usage was as follows: 38.71% of students always used it, 10.60% used it often, 5.07% used it sometimes, and 11.52% used it only rarely. The results show that laptop was the most popular device. The second and the third most preferred devices were mobile and iPad respectively. Desktop was the least preferred device, which very few students used.

Figure 3: Frequency of use of devices to access the Internet

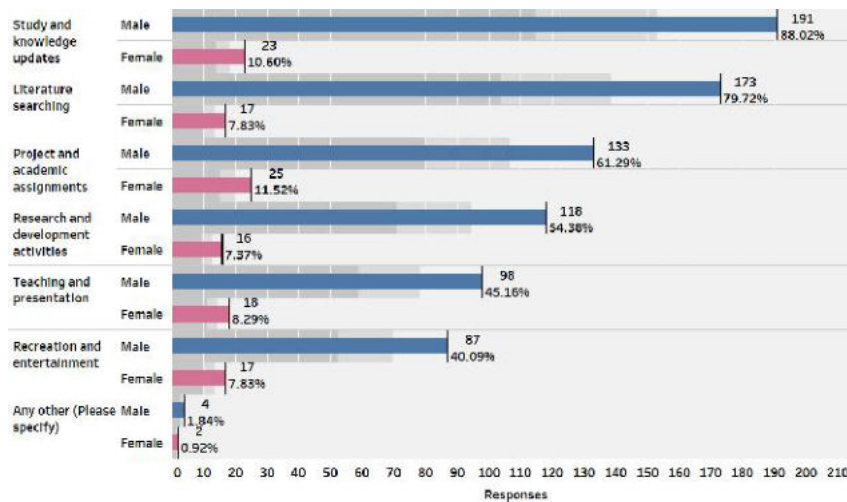


Purpose of accessing Internet resources

The Internet technology has become an essential platform for the academic fraternity to find scholarly resources. The respondents were asked to provide their opinion on why and for what they used the Internet. They gave their views on a feedback form as statements, which were later shortened into seven categories. Figure 4 shows the purpose behind accessing and using Internet resources. Most students mentioned that they

used the Internet to study and to update their knowledge. The second most preferred purpose was literature searching. The third and the fourth most popular reasons were, respectively, to perform project and academic assignments and to carry out research and development activities. 116 (53.46%) students used the Internet for teaching and making presentations. 104 (47.93%) students used it for recreation and entertainment. Only six students described using the Internet for other purposes.

Figure 4: Purpose behind accessing and using the Internet resources



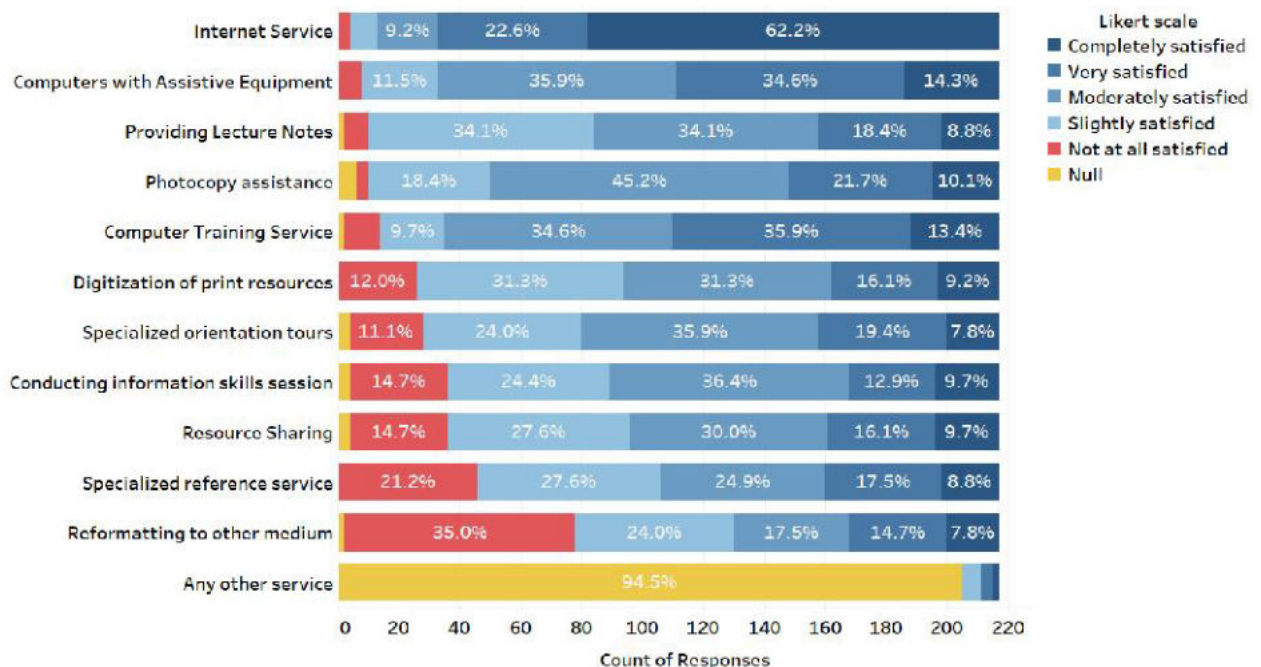
The libraries at the Indian Institutes of Technology provide the best resources and services to the differently-abled patrons. However, all needs of patrons cannot be fulfilled due to budgetary and other constraints. The students “strongly agreed” that their needs were fulfilled, but said that “sometimes” they needed more resources. So, they were asked whether they approached any other libraries or librarians for their requirements. As many as 123 (56.68%) respondents mentioned that their libraries lacked resources. Sometimes the resources were available but in an inaccessible format for persons with disabilities. The patrons were using the technological support provided by the library, but did not get all the tools and devices. They also said that a few of the members of the staff were not adequately trained and, therefore, did not provide the required support and facilities. The overall feedback from the students was that they

accessed other libraries or approached their friends and colleagues when they did not get the required resources within the library.

Satisfaction with the library services

Students were satisfied with the Internet services but not with the technological support, especially assistive technologies. The libraries of the Indian Institutes of Technology have all the latest tools and technologies, but the students lack the training on how to use them. Figure 5 shows the students’ satisfaction level with the library services. With the Internet service, 62.2% of students were completely satisfied, 22.6% were very satisfied, 9.2% were moderately satisfied, 4.1% were slightly satisfied, and 1.8% were not satisfied at all. The students expressed the need for a special reference service for persons with disabilities if any information was required urgently. Libraries should practice resource

Figure 5: Students’ satisfaction level with the library services



sharing with special libraries to meet the needs of the students. The rising cost of resources constrains libraries. The best way to overcome it is to establish an effective communication network with other libraries to share resources and services for persons with disabilities.

Availability of electronic information and resources in the library

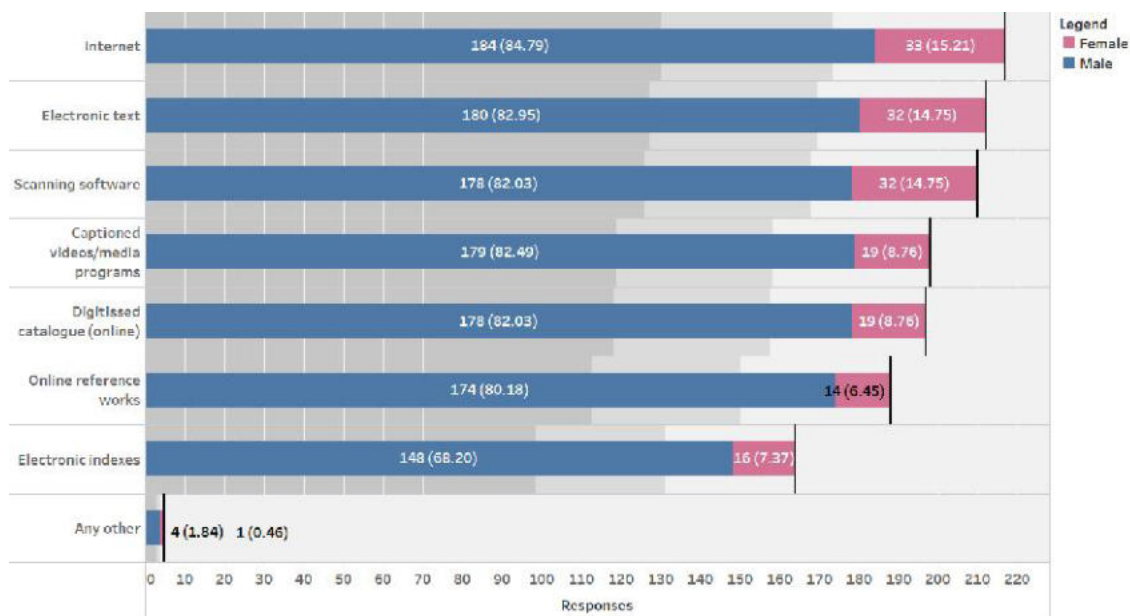
Plenty of tools and technologies are available for persons with disabilities. There may be a unique tool or two for a disability of a certain degree. However, most tools are very common or basic to all. Therefore, a question was asked of the students as to the types of electronic information and resources available in the library. Figure 6 shows the types of electronic information resources available in the library. A total of 217 students answered this question and all of them agreed on the presence of the Internet

in the library. 212 (98%) students acknowledged the presence of electronic text, and 210 (97%) agreed that scanning tools and software were available in the library. There was no lack of tools and technologies in the library. The essential tools were very much provided to the differently-abled students.

Areas in which training is needed

Results show that only 151 (69.59%) respondents received training and orientation conducted by the library for the differently-abled students, while the remaining 60 (27.65%) students did not attend any training. All the students, whether or not they attended the orientation program, were asked to identify the areas they wanted to receive training in. Figure 7 shows the areas in which the students needed training. Most students mentioned that they needed training in how to use web resources for the

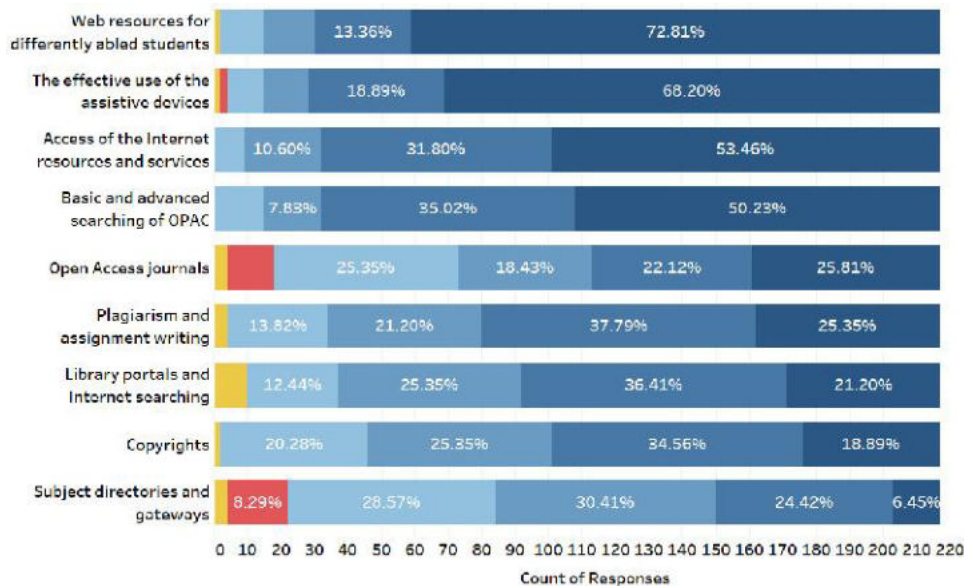
Figure 6: Types of electronic information resources available in the library



differently-abled students. 72.8% of the students described this need as extremely important, 13.4% as very important, 6.9% as moderately important, and 6.0% as slightly important. This is quite interesting because there is a plethora of resources available on the Internet which can be easily accessed with simple and advanced search

techniques if the students are oriented on what those resources are and how they can be accessed. The students also mentioned the need to know how to effectively use the assistive technologies and the need for awareness and orientation on copyright issues and plagiarism.

Figure 7: Areas in which training is needed

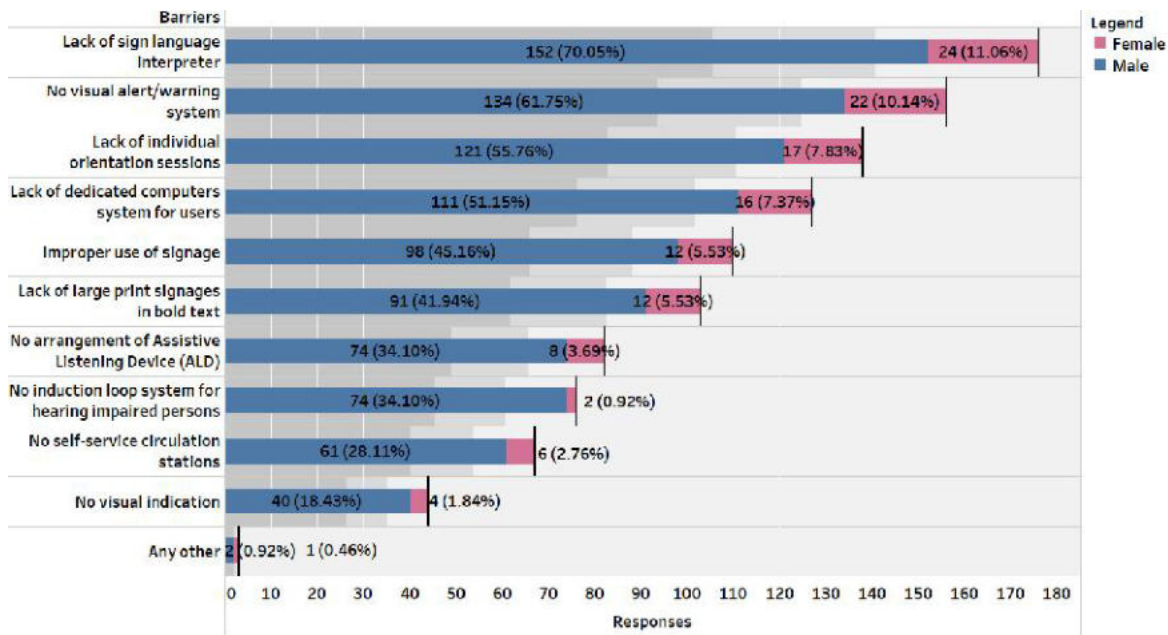


Barriers faced by students while accessing library services

The results show that the students were quite satisfied with the library and information services provided by the institutions. However, they faced many challenges while accessing those services. While the questions in the feedback form were closed and open-ended, the students mentioned some of the other challenges too. Figure 8 shows the barriers faced in accessing information. Most of the students said that there was a lack of sign language interpreters in the library. The other vital

aspects which are very much essential in the library but were missing included: lack of a visual alert or warning system; lack of individual orientation sessions; lack of a dedicated computer system for users; improper use of signage; lack of large print signages in bold text; improper placement of assistive listening devices; absence of induction loop system for hearing impaired persons; and absence of visual indications. Students also expressed the need for self-service circulation stations for the differently-abled students.

Figure 8: The barriers faced by students during information access



Satisfaction with the available assistive technologies

The students provided their feedback on the available resources and services in the institutions. They were asked to describe how satisfied they were with the assistive technologies and other services on a five-point Likert scale. All the details are tabulated in Table 2. In the age group 20-25 years, 21 male students were very satisfied, 44 male and four female students were satisfied, six male and six female students were neutral, and 15 male and three female students were dissatisfied. In the age group 26-30 years, 12 male and six female students were very satisfied, 28 male and six female students were satisfied, 13 male and one female student were neutral, and 10 male students were dissatisfied. In the age group 31-35 years, four male students were very satisfied, 14 male and four female

students were satisfied, one male and one female student were neutral, and six male and two female students were dissatisfied. In the age group 36-40 years, two male students were very satisfied, and eight male students were satisfied. Overall, the students were satisfied with the assistive technologies available in the library and the institution.

CONCLUSION

Assistive technology plays a vital role in the lives of differently-abled persons or persons with disabilities. It enhances access to and dissemination of information and allows for tasks to be performed very effectively and efficiently. There are plenty of assistive technology tools, but a few of them are especially useful like JAWS, SAFA, Kurzweil, and Zoom Text. The results show that students were “satisfied” with library and information services, but they were only “quite

Table 2: Satisfaction with the available assistive devices in the institution

Age	Gender	Very satisfied	Satisfied	Neutral	Dissatisfied	Grand Total
20-25	Female		4 30.77%	6 46.15%	3 23.08%	13 100.00%
	Male	21 24.42%	44 51.16%	6 6.98%	15 17.44%	86 100.00%
	Total	21 21.21%	48 48.48%	12 12.12%	18 18.18%	99 100.00%
26-30	Female	6 46.15%	6 46.15%	1 7.69%		13 100.00%
	Male	12 19.05%	28 44.44%	13 20.63%	10 15.87%	63 100.00%
	Total	18 23.68%	34 44.74%	14 18.42%	10 13.16%	76 100.00%
31-35	Female		4 57.14%	1 14.29%	2 28.57%	7 100.00%
	Male	4 16.00%	14 56.00%	1 4.00%	6 24.00%	25 100.00%
	Total	4 12.50%	18 56.25%	2 6.25%	8 25.00%	32 100.00%
36-40	Male	2 20.00%	8 80.00%			10 100.00%
	Total	2 20.00%	8 80.00%			10 100.00%
Grand Total		45 20.74%	108 49.77%	28 12.90%	36 16.59%	217 100.00%

satisfied” with technical and outreach services. So, it is right time for librarians to reach out to persons with disabilities and educate them about emerging tools and technologies, it is the right time. Students need to be aware of e-resources, and libraries should educate them on using assistive technology. Doing so has become indispensable after the COVID-19 pandemic. Learners need to be engaged in multiple ways (Pionke, 2020). Libraries should start implementing innovative support and organize training events for the differently-abled communities. Based on this research study’s findings, it is recommended that libraries should allocate an adequate budget for innovative technologies and support. There should be a universal design of learning; that requires the

library’s policy formulation to provide special services for persons with special needs. The library building should also be made accessible, and the installation of assistive technology should be on the priority list of the library for the differently-abled students. An exhaustive research can be done in the future on the special tools, resources, and services needed by differently-abled persons based on the degree of their disability.

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