

A study on

**Addressing the Challenges and  
Barriers Faced by Students with  
Visual Disabilities in Harnessing  
Technology for Higher Education: A  
Perspective from Bangladesh**

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## Executive Summary

The study recognizes the significant impact of addressing challenges and barriers faced by Students with Visual Disabilities in utilizing technology for higher education, focusing on the context of Bangladesh. The study underscores the growing opportunities for Persons with Visual Disabilities in using technology in higher education, inclusive policies, governmental initiatives, and specialized training programs. The findings section, supported by both quantitative and qualitative data, unveils the financial challenges, device preferences, and barriers faced by Students with Visual Disabilities in higher education which put forth a comprehensive set of strategies, spanning accessible course materials, teacher training, resource centers, and awareness campaigns, aiming to create an inclusive and supportive environment for Students with Visual Disabilities.

The study employs a mixed methodology, combining quantitative and qualitative approaches to investigate the challenges confronted by Students with Visual Disabilities in utilizing technology for higher education, particularly in the context of Bangladesh. The research involves a systematic literature review and a multi-staged approach, including a survey with 71 participants from diverse educational backgrounds at universities and colleges across Bangladesh. Two FGD and two key informant interviews further supplement the qualitative aspect. The research analyzes challenges such as the cost of assistive technology, training, resource centers, classroom management, technological barriers, admission processes, availability of accessible course materials, technological devices, and teacher attitudes. The mixed methodology provides a comprehensive understanding of the issues faced by students with visual disabilities, contributing valuable insights for interventions to improve Technology accessibility in higher education.

the study's findings present a comprehensive overview of the challenges faced by Students with Visual Disabilities in Bangladesh regarding Technology adoption for higher education. The quantitative data reveals financial constraints affecting 75.36% of participants emphasizing the need for cost-effective alternatives. A high dependence on smartphones (67.95%) underscores the importance of mobile-compatible solutions. Despite technical training (89.74%), perceived efficacy is at 60%, suggesting potential deficiencies. Admission process difficulties (96.56%) and dissatisfaction with Resource centers (64.79%) highlight barriers. Qualitative data accentuates

financial challenges, the absence of a native TTS system, and the call for cost-effective alternatives. Lack of awareness, insufficient resources, and limited availability of accessible course materials further emphasize the need for targeted interventions and collaborative efforts to overcome technological accessibility barriers in higher education for Students with Visual Disabilities in Bangladesh.

The research paper concludes with a set of comprehensive recommendations aimed at addressing the identified challenges. These recommendations encompass investing in accessible course materials, implementing training programs for educators and students, establishing university resource centers, decentralizing services, integrating technology assistance, and developing special sections on university websites for Students with Visual Disabilities. Additionally, the paper advocates for research, innovation hubs, government support, tax breaks, subsidies, and adherence to accessibility standards to create an inclusive environment and collaboration with technology companies underscores the need for a holistic approach. Emphasizing advocacy, self-determination strategies, and ongoing research, these recommendations collectively seek to bridge the digital divide and create a more inclusive educational environment for Students with Visual Disabilities in higher education.

The study provides a thorough exploration of the challenges faced by Students with Visual Disabilities in Bangladesh, offering insights into their unique needs and proposing a set of actionable recommendations to foster inclusivity, awareness, and support in higher education. reveals challenges in accessing higher education in, emphasizing financial constraints, limitations and technological barriers. The recommendations propose a comprehensive approach to address these challenges, promoting inclusivity

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## Abstract

The study emphasizes the increasing prospects for visually disabled individuals in Bangladesh's technology sector, driven by developments in technology, inclusive policies, initiatives by the government, and specialised training programmes. The results, substantiated by both quantitative and qualitative data, uncover financial challenges, technology inclinations, and barriers confronted by visually disabled students in higher education. The study put forth a holistic range of solutions, including the provision of easily available course materials, training for teachers, establishment of resource centres, and implementation of awareness campaigns. The ultimate objective is to establish an inclusive and friendly atmosphere for students with visual impairments.

## Chapter 1: Introduction

### 1.1 Introduction

Visual Disabilities poses a significant global health challenge, has an impact on millions of peoples on their social relationships, work prospects, and quality of life. An estimated 285.405 million people suffer from vision disability globally; these individuals are divided into 246.024 million Persons with Visual Disabilities s and 39.365 million people who are blind. According to data from the World Health Organization from 2012, 4.24 percent of people worldwide have vision disability, according to the Bangladesh Bureau of Statistics (BBS), approximately 4 million people in Bangladesh are dealing with visual disabilities. As per the NSPD 2021, the prevalence of visual disability is 0.46% of the overall population and 0.58 percent of those people are considered blind based on best corrected visual acuity (BCVA). Regarding Bangladesh, a developing country with a population of roughly 159.453 million, vision disability becomes a major public health issue. 2.18% of those who have higher education [NSPD 2021]

In Bangladesh, 750,000 cases of blindness have been reported, with a higher incidence among those 30 years of age and older. A startling 85% of these cases are caused by cataracts, and

120,000 new cases are added to the national total each year. The difficult socioeconomic environment in Bangladesh, where the majority of people pay for over 90% of healthcare expenses out of pocket and only a small portion is covered by the government and non-governmental organizations (NGOs), exacerbates this problem even further (WHO)

Visual Disabilities has an impact on society as a whole, not only on the affected person. Significantly, 48% of blind people in Bangladesh say they feel "moderately" or "completely" cut off from their environment and other people. The difficulties experienced by this vulnerable group are exacerbated by Bangladesh's dense population, which has 1,045 people per square kilometer. This makes meeting the healthcare

needs of people with Visual Disabilities much more complicated. The possibility of utilizing assistive technology shows promise in the face of these obstacles. The scope and diversity of assistance provided by assistive technologies are enormous. In recent years, the idea of universal computing—a kind computer interaction paradigm where technology integrates into the surroundings—has grown in popularity This study aims to investigate the various aspects of Visual Disabilities in Bangladesh, including its prevalence, socio-economic consequences, and the difficulties associated with cataracts as the

primary cause of blindness. By comprehending the subtleties of this problem, we hope to provide insights that could guide focused interventions, the creation of policies, and the distribution of resources to enhance the lives of people with Visual Disabilities in Bangladesh and possibly act as a model for addressing similar challenges globally.

Unfortunately, the beginning of vision disability eventually leads to a reduced ability to obtain information and complete everyday activities. In modern society that values knowledge, the capacity to retrieve information is not only essential for everyday tasks but also vital for engaging in school and work. Assistive technologies are crucial in enabling Persons with Visual Disabilities to access information. The advancement of presentation technologies that rely on touch and sound has significantly enhanced the accessibility of information. These alternative modalities are efficacious replacements for conventional visual presentations and can be utilized in various formats, including webpages, charts, graphs, and even facial expressions. Although these solutions are significant, it is important to acknowledge that they do not include mobile assistive technology, which are beyond the scope of this review.

## 1.2 Background

Social welfare program start is too in this country from 1955 A. D visually disabled education start is in Bangladesh from 1957A.D. Helen Keller came to Dhaka one stage of Asia confers in 1955 A.D. Then comradery of East Pakistan beeping ovation. Her cognition depth beholds membership of Rotary Club swoon. Among them be born a new mind. Each and every visually disabled child of Bangladesh become one-one person Helen Keller, just this goal at attempt Rotary Club be inspired of Dhaka at Tejgaon industrial city by found a school named Rotary

Visually Disabled School happy Introduce of Visually Disabled education in 1957.

In 1982, the Department of Social Services created five dormitories as a component of an inclusive education initiative for individuals with vision impairments. The program's initial success prompted its expansion to eleven hostels, resulting in the establishment of a partially integrated program. The primary objective was to facilitate the inclusion of children with disabilities in nearby schools, ensuring they may get education in their own surroundings. Nevertheless, the socio-economic circumstances in Bangladesh, together with communication obstacles, lack of education among families, and destitute parents, rendered it impractical for visually disabled children to enroll in mainstream educational institutions. These families did not have the resources to enroll their visually disabled children in school, as they needed extra assistance such as a co-operator or sighted guide, which was a financial burden for impoverished parents. As a result, it became necessary for visually disabled children to be admitted to dormitories as part of the integrated education program, which is overseen by resource teachers. This ensures that these children have access to education even though they may face communication obstacles.

The ERCPH vocational training and rehabilitation center was founded in Tongi, Gazipur in 1978. It has a Braille Press specifically designed for producing educational materials for individuals with visual impairments. The National Centre for Special Education (NCSE) was established in 1987, providing a range of educational and training programs for individuals with disabilities, including undergraduate and graduate degrees. In 1995, the integrated education program for individuals with visual impairments was extended to encompass all 64 districts, hence offering accommodation facilities. Students in special education programs

get education up to the fifth grade, after which they move to integrated programs for higher education, such as university courses. The Department of Social Services provides support

### 1.3 Scope

As in many other nations, the opportunities for visually disabled people in Bangladesh's IT sector are steadily growing. There are several reasons behind this encouraging trend:

- **Innovations in Technology:** The IT industry is always changing, and new technological developments are making it easier for people to use for those who are blind or visually disabled. Accessing information and navigating digital platforms is made possible for visually disabled people by assistive devices such as braille displays and screen readers.
- **Inclusive Policies:** A growing number of IT-related firms understand the value of inclusion and diversity. In order to foster an inclusive workplace that accommodates people with disabilities, including visual impairments, rules and procedures are being put into place.
- **Governmental Initiatives:** A more accessible educational environment for blind students can be achieved through government programs that emphasize inclusive education and laws requiring certain accessibility requirements for instructional materials.
- **Programs for Teacher Training:** Blind pupils' learning can be improved by putting in place training programs that help teachers use and integrate assistive technologies in the classroom.
- **Audiobooks and E-books:** Blind students can gain a great deal by having more educational resources available in electronic media, such as e-books and audiobooks.

for these students until they take the HSC examination. (9)

There are several assistive technologies that make it simple to access these formats.

- **Online Courses with Features for Accessibility:** Encouraging the creation of online courses with integrated accessibility elements guarantees full participation from blind students. This entails offering screen reader-compatible interactive components, multimedia content with audio descriptions, and accessible documents.

### 1.4 Objective of the study:

- Identify and delineate the barriers that visually disabled individuals
- Evaluate how visually disabled individuals in Bangladesh utilize technology for higher education.
- Identify and understand the barriers faced by visually disabled students when using technology.
- Investigate the underlying causes contributing to technological barriers.
- Recommend practical solutions and best practices to overcome these barriers.
- Assess the effectiveness of existing government initiatives related to technology in higher education.
- Improve and expand training programs for visually disabled individuals on technology use.
- Explore collaborations between government, private entities, and NGOs to enhance support for visually disabled students.
- Develop strategies to empower visually disabled individuals to contribute to society through technology proficiency.

## Chapter 2: Literature Review

The academic study on the current situation of visually disabled students in Bangladesh and comparable difficulties worldwide uncovers noteworthy constraints, with a consistent trend of inadequate investigation across nations. According to Snoeyink and Ertmer (2001), the first order barriers consist of a shortage of equipment, the unreliability of equipment, a lack of technical assistance, and other challenges that are related to resources. Second-order barriers encompass school-level characteristics, such as organizational culture, as well as teacher-level issues, such as beliefs regarding teaching and technology, and willingness to embrace change. Integrating ICT requires additional resources, such as computers, printers, multimedia projectors, scanners, etc - which may not be accessible in all educational institutions (Snoeyink and Ertmer, 2001).

An important barrier is the lack of knowledge and abilities among instructors regarding the efficient utilization of ICT tools and applications. Heather Hill (2013) highlights the limited participation of individuals with disabilities in research conversations, resulting in shortcomings in evaluating accessibility and enacting policy (Heather Hill, 2013). The empirical study conducted on university students in Tanzania by Eligi and Mwantimwa, 2017, reveals that insufficient availability of ICT facilities has a significant effect on the learning process. This leads to time-consuming tasks and a greater need on assistance from readers (Eligi and Mwantimwa, 2017). The lack of information in this area serves as a major obstacle, restricting the smooth integration of technology into instructional methods.

Adding to this problem is a scarcity of teachers, which is made worse by the extra burden of administrative duties that many educators bear. Teachers are left with limited time to create,

cultivate, and incorporate technology into their teaching methods due to this double responsibility. The limited time available emphasizes the necessity for teachers to have dedicated periods to develop expertise in managing hardware and software, successfully strategize, and engage in collaborative work with their colleagues. Teaching statistics to blind students presents distinct difficulties, and numerous studies have explored successful approaches. Gibson and Darron (1999) investigate the utilization of tangible objects such as modeling clay and raised line drawing kits to communicate ideas such as the form of distributions (3). Mechan et al. (1993) also explored the use of manipulatives, providing valuable information on verbalization and testing techniques (Mechan et al., 1993). In their study, Vita and Kataoka (2014) propose an innovative instructional method that involves the use of tactile models to teach concepts related to probability and random walks (Vita and Kataoka, 2014). Marson et al. (2013) provide a thorough explanation, discussing problems and offering remedies for instructing blind pupils in introductory statistics. Every study provides vital insights to improve the introductory statistics learning experience for this specific group of students (Marson et al., 2013).

At a broader level than just individual teachers, there are other systemic elements that impact the successful integration of ICT in Bangladesh's educational system. Keengwe et al. (2008) identify inadequate administrative assistance as a crucial obstacle that further impedes the incorporation of technology into instructional methods (Keengwe et al., 2008). Moreover, the insufficiency of adequate staff training, particularly for educators and school administrators, is recognized as a noteworthy hindrance (Mamun, M. A. & Tapan, S.M., 2009). The lack of competent ICT coordinators, crucial individuals in supporting instructors in the incorporation of ICT in both classrooms and

laboratories, worsens the difficulty. Moreover, the lack of a favorable school culture that promotes and facilitates the utilization of ICT hinders advancements in this field (Afshari et al, 2009; Buabeng-Andoh, 2012).

In Bangladesh, the incorporation of Information and Communication Technology (ICT) encounters substantial obstacles, mainly due to language difficulties and a lack of knowledge and skills required for efficient exploitation of ICT. This problem is worsened by the scarcity of software in the Bangla language, given that the majority of software products are primarily developed in English, which is the second most often used language in the country. A discriminatory policy segregates children with impairments, so barring them from accessing educational or vocational training opportunities. Despite of these policies, they have not been put into practice, resulting in inadequate allocation of resources for the education of visually disabled students in Bangladesh (Malak, 2013). Students who are visually disabled do not have access to any technology that could aid in their education or help them learn Braille. Since open-source screen-reading software is only available in English, it is not helpful for the majority of students with visual impairments who are computer illiterate and do not understand English. Thus, the primary goal of this research is to develop a useful technology tool for Bangladeshi students who are visually disabled. (Nahar, Lutfun; Jaafar, Azizah; Ahamed, Eistiak; Kaish, A. B. M. A., 2015). For visually disabled students, learning is not a simple endeavor. They rely on their auditory and tactile senses. For Visually disabled to read and write, Louis Braille created Braille (Braille, 1829).

According to Afshari, Bakar, and Su-Luan et al. (2009), the availability of hardware and software, as well as the equitable distribution of access to resources among instructors, pupils, and administrative staff, are critical factors in

determining effectively and efficiently utilizing technology. Several major urban areas have a limited number of higher education institutions that possess ICT facilities, yet struggle to successfully incorporate them due to a lack of a clear vision and plan (Afshari et al, 2009).

Bhardwaj and Kumar (2017) conducted a study at the University of Delhi to investigate the learning environment of visually disabled students. The survey revealed previously unknown characteristics of their educational setting. Roughly 66% of the students were unable of taking notes during lectures, primarily depending on auditory reception from teachers. 60% of the pupils had significant challenges due to the lack of accessibility to the current facilities. The study highlights that the mere provision of a facility does not automatically assure its accessibility; other measures must be taken to ensure its usability. The researchers propose implementing typing courses to improve students' utilization of provided laptops and creating audio bulletin boards for obtaining campus information. The presence of a limited supply of study material in digital format, even when it is accessible, presents further difficulties. These findings emphasize the necessity for more extensive study and targeted treatments to tackle the distinct difficulties encountered by visually disabled students in different educational environments (Bhardwaj and Kumar, 2017). To tackle these complex difficulties, a holistic approach is needed, encompassing professional growth, administrative backing, and a transformation in the culture of educational institutions to promote a technology-friendly atmosphere.

Drawing from the findings of Harrison and Rainer (1992), it becomes obvious that individuals harboring unfavorable attitudes towards computers tend to exhibit lower levels of competency in their use of technology. As a result, they are less likely to embrace and adjust to technological improvements in comparison to

their peers who have favorable views. Harrison and Rainer's conclusion emphasizes the crucial need of addressing and changing negative attitudes as a necessary condition for improving individuals' computer skills. Hence, it is crucial to make concerted efforts to cultivate a favorable attitude towards ICT in order to surmount the obstacles arising from inadequate skills and education in the context of Bangladesh (Harrison & Rainer, 1992).

The influence of Information and Communication Technology (ICT) on the education and reading skills of visually disabled pupils is unquestionably substantial. Electronic interactive whiteboards are highly useful in enabling group learning for visually disabled pupils. ICT's adaptability helps visually disabled students in numerous domains, granting them access to content in diverse formats through multiple media channels. Technological devices such as cell phones, landlines, televisions, SMS, email, Voice over Internet Protocol services, web conferencing, and social media platforms help improve their ability to access instructional material (Hersh & Mouroutsou, 2019; Mavrou & Loizou-Raouna, 2017).

Contemporary operating systems, such Microsoft Windows and Mac OS, are equipped with inherent accessibility features, such as text-to-speech, voice recognition, mouse and keyboard navigation preferences, contrast settings, and magnification. Crucially, these characteristics do not result in any extra expenses for users (Learson, 2014). TapTapSee is a mobile application that assists individuals with vision impairments in identifying objects. It accomplishes this by taking images and using a crowd-sourced image database to determine what the objects are. Applications that utilize barcode scanning, optical character recognition to read menus aloud, and offer Braille keyboards, enhance accessibility (Foley & Ferri, 2012).

Although the advantages of ICT are clear, there are also ongoing obstacles. Hersh and Mouroutsou (2019) identify several obstacles that impede access to information and communication technology (ICT). These include language difficulties, financial constraints, absence of funding sources, limited awareness, and incompatible assistive equipment. Visually disabled individuals in low- and middle-income countries find obstacles in obtaining assistive devices because to the high expenses and limited accessibility of specialist equipment (Ali et al., 2019; ITU, 2013; Monaco et al., 2019).

The effective incorporation of technology into the curriculum relies on a comprehensive strategy that includes experience in certain subjects, knowledge of teaching concepts, and a necessary level of technical skill. In Bangladesh, the widespread implementation of Information and Communication Technology (ICT) in the teaching-learning environment faces various obstacles. Moreover, the diverse views among teachers towards technology add further complexity to the application of ICT. While certain instructors face challenges in effectively utilizing technology owing to nervousness, lack of interest, or motivation, others may be resistant to exploring new tools and approaches.

The lack of financial support from the government in low- and middle-income nations worsens the already expensive nature of assistive technology, making it difficult for people to afford and limiting the broad usage of information and communication technology (Segers, K. S., 2014)). Nevertheless, numerous studies underscore the significance of integrating information and communication technology (ICT) and assistive technology for those with visual impairments, acknowledging their potential for social inclusion (Agree, 2014).

## Chapter 3: Methodology

The study utilizes a mixed methodology, incorporating both quantitative and qualitative approaches to comprehensively investigate challenges faced by Students with Visual Disabilities in higher education, with a specific focus on technology accessibility. The study on challenges and barriers faced by Students with Visual Disabilities in accessing and using technology in higher education has been identified using a multi-staged, systematic approach to our literature research. During the first stage, a comprehensive survey for Students with Visual Disabilities was conducted using mixed methodology using quantitative method and qualitative method

### 3.1 Quantitative Method:

- **Sample Size:** The study includes 71 participants, comprised of students with visually disabilities in higher education.
- **Participant Profile:** Participants are selected from diverse educational backgrounds, representing various levels of higher education from universities and colleges across Bangladesh.
- **Survey Location:** University of Dhaka, Jahangirnagar University, University of Chittagong, Government Teachers Training College, Dhanmondi Ideal College, Mohammadpur Mohila College, Prime University and Others.

### 3.2 Qualitative Method

- **Number of Focus Group Discussion (FGD):** Two Focus Group Discussion sessions involve Students with Visual Disabilities in higher education.
- **Participant Profile of Focus Group Discussion (FGD):** The Focus Group Discussion (FGD) include Students with

Visual Disabilities at the higher education level.

- **Number of Key Informant Interviews (KII):** Two Key Informant Interview (KII) sessions occurred.
- **Participant Profile of (KII):** Key informant interviews include a university teacher and an administrator.

### 3.3 Data Analysis:

The study has been focused on descriptive statistics for quantitative data, including mean age (23.47) and standard deviation (SD = 2.63). We have collected a wide range of data through structured questionnaires and interviews incorporating single data, multiple data, and open-ended questions. Surveys were administered to 71 respondents, providing a comprehensive dataset on technology devices owned, used, and the challenges faced. The Students with Visual Disabilities respond to the survey where to identify a spectrum of challenges faced in accessing and using technology in higher education. The research categorized into three stages: Blindness, Partial Blindness, and Low Vision. Participants include postgraduate and graduate students receiving education at the university level.

The mixed methodology offers a comprehensive exploration, combining the strengths of quantitative and qualitative methods. Findings contribute valuable insights for interventions to enhance technology accessibility for Students with Visual Disabilities in higher education.

## Chapter 4: Democracy and Human Rights Alignment

The study explores barriers faced by Individuals with Visual Disabilities in higher education technology use, emphasizing the importance of addressing accessibility requirements at the design stage. It emphasizes the need for early consideration of accessibility principles to ensure

inclusive technology for Individuals with Visual Disabilities. This aligns with the pursuit of equal opportunities, inclusivity, and empowerment, fundamental principles of human rights and essential components of a democratic society.

- Ensuring equal access to education, including higher education with the aid of technology, aligns with the principles of human rights.
- The youth generation is often at the forefront of technological advancements and social change by improving technology access for Persons with Visual Disabilities in higher education.
- Democracy thrives on equal participation and representation of all citizens. Improving technology access for Persons with Visual Disabilities aligns with democratic principles by fostering inclusivity and ensuring that a diverse range of voices, including those with Visual Disabilities, can actively engage in educational and societal processes. Human rights, and democracy by promoting equal access to education through technology, empowering individuals with Visual Disabilities, and contributing to a more inclusive and participatory society.

1. **Identify and delineate barriers for individuals with Visual Disabilities:** The discussion on accessibility barriers in technology design, especially in the context of standards bodies, aligns with the objective of identifying and delineating barriers faced by individuals with Visual Disabilities. It emphasizes the importance of addressing accessibility requirements at the design stage.
2. **Evaluate technology utilization for higher education:** The topic discusses the critical role of information and communication technology (ICT) in various aspects of society, including education. It complements the objective of evaluating how Persons with Visual Disabilities in Bangladesh utilize

technology for higher education by emphasizing the significance of accessible ICT tools.

3. **Understand barriers faced when using technology:** The discussion on accessibility barriers in the digital environment directly relates to understanding the barriers faced by Students with Visual Disabilities when using technology. It provides context for the challenges that need to be addressed.
4. **Investigate underlying causes of technological barriers:** The topic delves into the importance of addressing accessibility principles early in the design stage of emerging technologies, aligning with the objective to investigate the underlying causes contributing to technological barriers.
5. **Recommend practical solutions and best practices:** The discussion on the role of standards bodies in shaping social aspects of technology design aligns with the objective of recommending practical solutions and best practices to overcome barriers. Standards bodies play a crucial role in establishing guidelines for accessible technology.
6. **Assess government initiatives related to technology:** While the topic does not explicitly assess government initiatives, it emphasizes the importance of addressing accessibility requirements early in the development process, which indirectly relates to the need for effective government initiatives in the field of technology accessibility.
7. **Improve and expand training programs:** The discussion und emphasize the need for accessibility principles in the design stage, supporting the objective to improve and expand training programs for Persons with Visual Disabilities on technology use. It

implies that training programs should incorporate these principles.

8. **Explore collaborations for support:** Collaboration is mentioned in the objectives as a means to enhance support for Students with Visual Disabilities. The topic reinforces the idea of collaboration by highlighting the role of standards bodies, which often involve collaboration between various stakeholders.
9. **Develop strategies for empowerment:** The overall theme of the discussion, emphasizing the importance of addressing accessibility at the design stage, aligns with the objective to develop strategies to empower Persons with Visual Disabilities through technology proficiency.

The objectives of the study's perspective, it underscores the crucial role of standards organizations in influencing the design of key technologies, particularly in the context of human rights and disability rights. It acknowledges that standards bodies might not be the first consideration for those working on human rights, emphasizing that they are often seen as entities capturing established practices rather than actively shaping social aspects of technology design.

It highlights the significance of standards bodies due to the central role of Information and Communication Technology (ICT) in society and

the rapid pace of technological change. It emphasizes the need to address accessibility requirements at the design stage of ICT products and services to prevent the exclusion of people with disabilities from the latest innovations. The mention of retrofitting difficulties after products are released underscores the importance of early consideration of accessibility principle.

## Chapter 5: Data Analysis

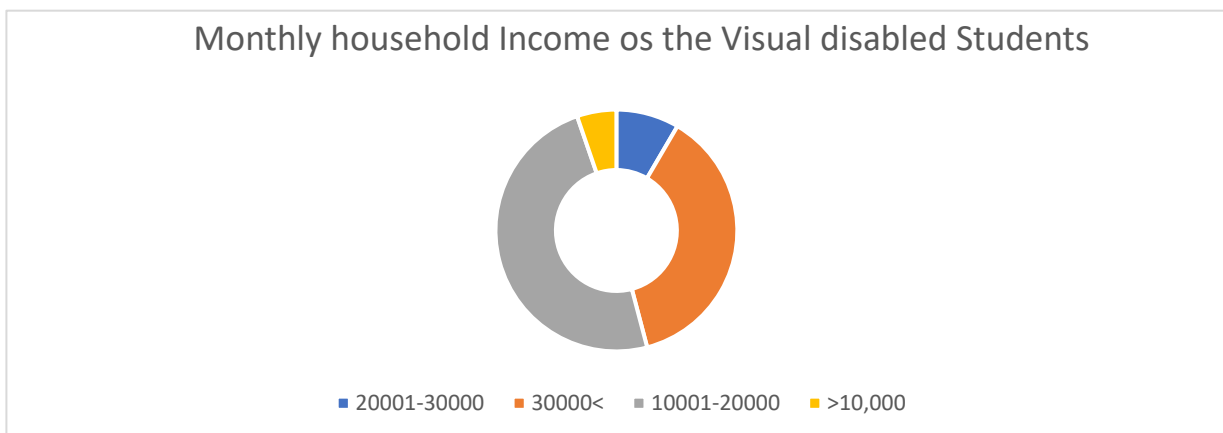
In general, it is necessary to analyze the factors that determine the challenges faced by visually disabled students in higher education. In our project we have used two different qualitative methods, two Key Informant Interviews (KII), and two Focus Group Discussions (FGD), and one quantitative method, a structured questionnaire including 71 participants, comprised of students with visual disabilities in higher education

### 5.1 Quantitative

#### Household Income and Technology Usage

- ✓ *What is your monthly household income?*
- ✓ *Do you use any types of technology in higher education?*
- ✓ *If yes, what digital devices do you own?*
- ✓ *Are you having financial difficulties in purchasing digital devices? 75.36%*

#### Based on the monthly household income?



### Percentage Distribution Result:

- 20001-30000: 7: 9.86%
- >10,000:22: 30.99%
- 10001-20000:37: 52.11%
- 30000<: 4: 5.63%

### Data Visualization:

Chart to visually represent the distribution of monthly household incomes.

### Additional Insights:

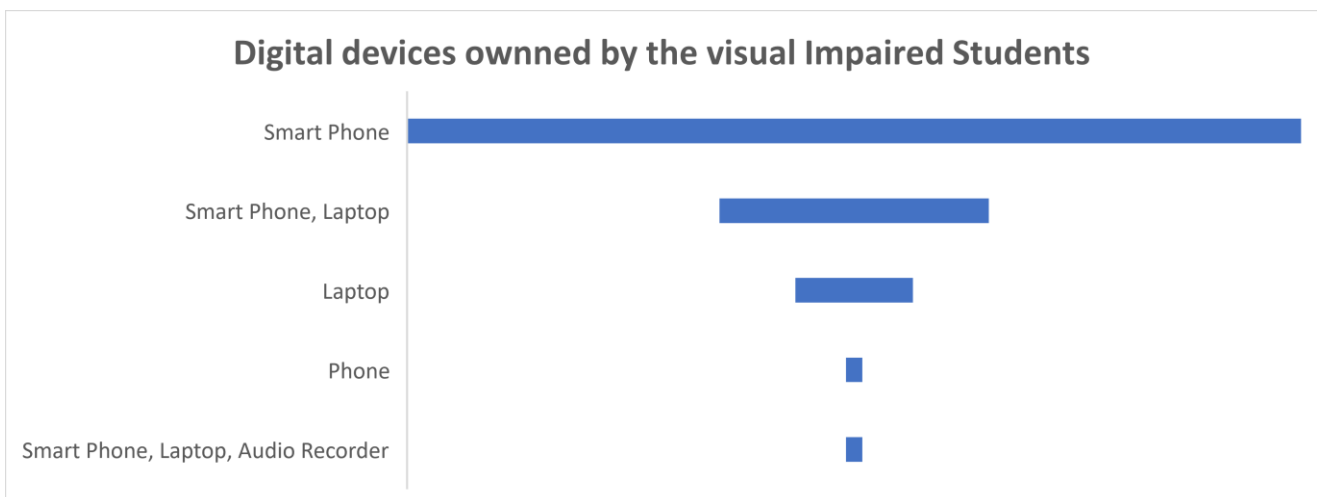
It appears that a substantial percentage of visually disabilities students have household incomes that might pose financial challenges. Specifically, a significant portion falls within the income range of 10001-20000 (52.11%), which could indicate that many of them may face difficulties in affording technology devices for their higher education. The percentage of students with incomes greater than 10,000 BDT is also noteworthy, emphasizing the financial constraints these students may encounter.

Approx. 98.59% of the 71 respondents use some type of technology in higher education. 78.36% of the responders had said that they were having financial difficulties in purchasing digital devices. 67.95% of them use only smartphone for their educational purpose, only 8.97% of them have a laptop. 20.51% use smartphone, laptop both. 1.28% uses audio recorder along with computer and laptop.

### Training and Resources Center

- ✓ *Have you received any technical training?*
- ✓ *If not, why?*
- ✓ *Where did you receive your training?*
- ✓ *Is the training you received useful in your higher education?*
- ✓ *If not, why not?*
- ✓ *If yes, what differences did you notice before and after training?*
- ✓ *Does your university have any training programs?*
- ✓ *If yes, is this training useful for your higher education?*
- ✓ *If not, is there a need for such training from the university in the case of higher education?*
- ✓ *Does your university have a technical support center?*
- ✓ *If yes, is the support you get there adequate for your education?*
- ✓ *If No, why do you think such support is not sufficient?*

The data we have collected from our respondents through a questionnaire: We have asked the responded if they had received any technical training. Approx.89.74% had responded positively. 50%of them had taken training from NGO, 27.42% had taken their training from Government organization, 22.58% had went for private



## Visual disabled Students received their training



■ NGO ■ Government ■ Private

We have asked the respondents if the training they received is useful in their higher education. 60% of the respondents replied in negative. We have asked them why they think it's not helpful. 21.09% of them blamed Lack of Well-Trained resource person, 19.05% blamed Irregularity During Training, 18.37% blamed Equipment Malfunction, 13.61% blamed lack of Accessible Training Material.

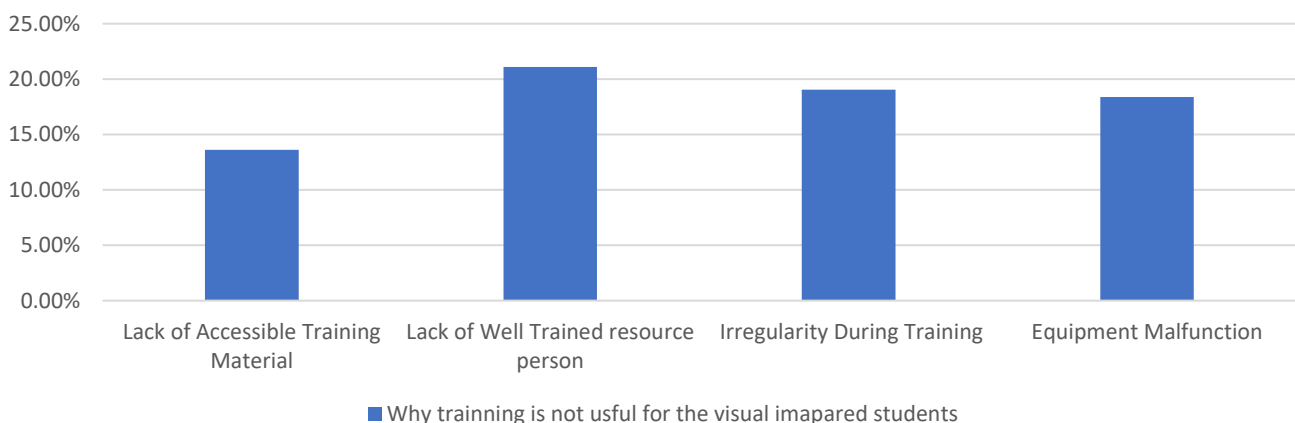
We have asked them if their university have any training programs for them. Approximately 97.18% of respondents mentioned that their university does not have training programs. This lack of training might extend to various aspects, including accessibility training for visually disabled students. 90.14% of the respondents had said that there is a need for such training from the university in the case of higher education. 50.67% of respondents who acknowledged the presence of a technical support center mentioned that the support they receive is not adequate. This could include accessibility challenges for visually disabled students. 64.79% among the "Yes" respondents said that the support they get from

their technical support center is not adequate for their education.

We have asked them why they think such support is not sufficient for them. Among them 40.74% blamed Lack of resources, Lack of trainers, Lack of suitable materials, Equipment Malfunction for not sufficient support. 11.11% laid the blame on Lack of resources, 15.74% blamed it on Lack of suitable materials, 17.59% blamed it on Lack of trainers, 0.93% blamed on Lack of useful materials. The identified challenges such as lack of resources, trainers, suitable materials, and equipment malfunction may contribute to a lack of tailored support for visually disabled students.

The data suggests potential challenges regarding training and support for visually disabled students in higher education. The absence of university training programs, inadequacy of technical support, and identified challenges (such as lack of resources, trainers, suitable materials, and equipment malfunction) indicate broader issues that may impact the inclusivity and customization of educational resources for visually disabled individuals. The qualitative responses from a

## Why training is not useful for the Visual Impaired Students



focus group participant and a key informant further highlight potential gaps in ongoing support and the need for more inclusive, tailored training programs for visually disabled students.

Individuals with visual disabilities face challenges maintaining and building technology skills due to infrequent use and a lack of accessible training. Specialized training programs targeted towards their specific needs and learning styles are urgently needed.

### Comprehensive and special training for visually disabled

- ✓ *Is the current information technology in Bangladesh sufficient for you in higher education?*
- ✓ *Do you think you need any training in technology that can accelerate your higher education?*

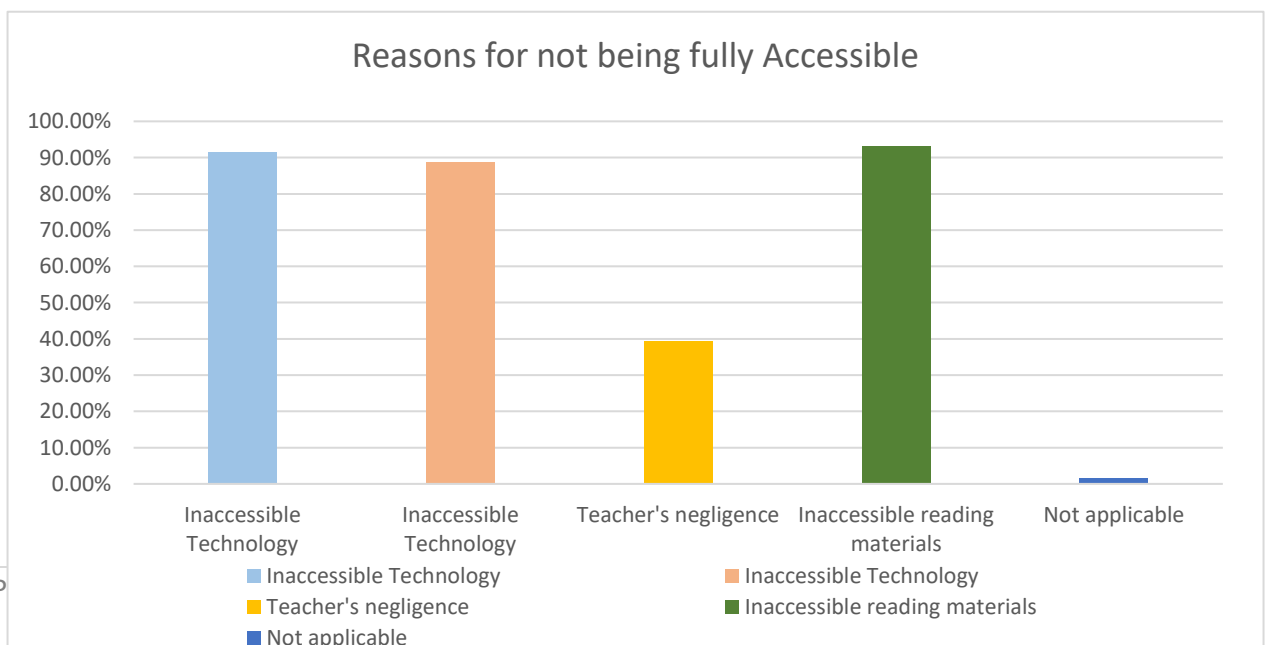
We asked 71 respondents if they think the need any training in technology that can accelerate their higher education. All the respondents (100%) agreed on the need for technology training emphasizes the crucial role of comprehensive and specialized training programs. These programs should not only cover general technology use but also address the unique requirements and challenges faced by visually disabled individuals.

We have also asked them how much they think that the current information technology in Bangladesh sufficient for them in higher education. The dissatisfaction (66.20%) with the current information technology for higher education in Bangladesh indicates a potential gap in the inclusivity of existing training programs. Specialized training should aim to bridge this gap by focusing on adaptive technologies, ensuring that visually disabled individuals have equal access to educational resources and opportunities. The survey results emphasize the necessity for comprehensive and special training programs that go beyond generic technology training. These programs should be tailored to the unique challenges faced by visually disabled individuals, aiming to enhance accessibility, promote inclusivity, and empower them with the skills necessary for successful higher education.

### Classroom Management

- ✓ *Can you do technology-based classwork or assignments like your classmates?*
- ✓ *Is it accessible to you if the teacher teaches through technology in the classroom?*
- ✓ *What are the reasons for not being fully accessible?*

Approximately 70.99% of the respondent's face challenges in completing technology-based



classwork or assignments due to their visual disabilities. This underscores a significant

barrier to digital inclusion, indicating potential discrepancies in access to and proficiency with technology among the surveyed individuals. The notable percentage of negative responses raises concerns about educational equity, suggesting a need for targeted interventions and support to ensure that visually disabled students have equitable opportunities in technology-driven learning environments.

Among the respondents approx. 60.56% said that it is somewhat accessible to them if the teacher teaches through technology in the classroom, whereas 32.39% said that is not at all accessible to them. 8.45% responded it's fairly accessible, only 1.41% said that it is fully accessible to them.

The majority of respondents (60.56%) indicate varying levels of accessibility challenges, with a significant portion expressing concerns about the adequacy of accessibility in the classroom. Further exploration of specific issues raised by respondents can provide insights into areas that may need improvement to enhance the overall accessibility of technology-based teaching for visually disabled students.

For this question majority of the respondents 92.96% laid the blame to Inaccessible reading

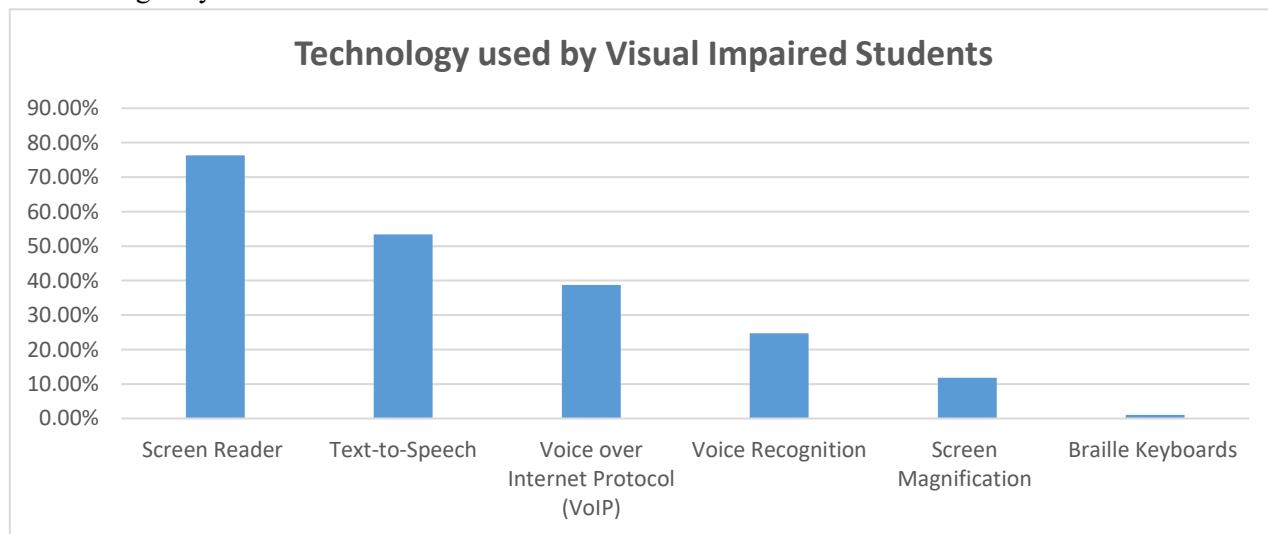
materials, 91.55% blamed Teacher's incompetence on accessibility, 88.73% blamed Inaccessible Technology, 39.44% blamed Teacher's negligence.

### Technological Barrier

- ✓ *Is technology a barrier to higher education for visually disabled students?*
- ✓ *Do you face any barriers to using technology due to language?*

In our survey focused on the challenges faced by visually disabled students in higher education, we inquired about their perspectives on technology as a potential barrier. A notable 35.21% of respondents expressed the view that technology poses a barrier to their educational pursuits. Additionally, our findings indicate that a significant 53.52% of respondents encounter barriers in using technology, particularly related to language. These insights shed light on the multifaceted challenges visually disabled students may face in leveraging technology for their academic advancement, emphasizing the importance of addressing accessibility issues and language-related barriers in educational settings.

We also asked the question “What are the reasons for not being fully accessible?”



## Admission Process

- ✓ *Did you manage to complete the university admission application yourself*
- ✓ *If yes, was the application process accessible to you?*
- ✓ *If not, how did you complete the application?*
- ✓ *Did you face any kind of problem in participating in the admission test?*
- ✓ *If yes, what kind of problems did you face?*
- ✓ *Is there a need to take technology-based admission tests to solve the problem?*
- ✓ *Was the university's online admission process accessible to you?*

96.56% of the 71 respondents were not able to complete their university admission application themselves. This is because 67 out of the 71 respondents circled "No" to "Did you manage to complete the university admission application yourself" question. 73.13% of them had used computer shop, 5.97% of them has taken help from family member, 1.49% of them took teacher's help to complete their admission process,

70.42% respondents said that they face problems in participating in the admission test. Among them 52.56% indicated that Non-availability of Scribers (Writer) is the main issue. 23.08% of them said Non-obtention of Scribers (Writer), 17.95% responded said it is Non-arrival of Scribers (Writer) on time at examination hall.

52.56% of the respondents didn't agree to take technology-based admission tests to solve the problem. 62.31% of the respondents said that the university's online admission process was not accessible to them. 65.33% of the candidates did not get any kind of help from their university authority in the online admission process.

We asked the specifically their suggestion if not, what type of assistance can be provided. 32.56% suggested to hire skilled manpower, 25.58% suggested to make the online platform of the admission process accessible, 20.93% suggested to hire skilled manpower, 20.55% suggested to provide information, 18.60% suggested to

facilitate the process to make the online process easier for them to access.

## Availability of accessible course materials

- ✓ *In what format does the teacher provide reading materials in the classroom?*
- ✓ *Are the reading materials provided by the teacher (soft copy) to you in an accessible format?*
- ✓ *If not, in what format would it be accessible to you?*
- ✓ *Do you get the necessary books for higher education in online or digital format?*
- ✓ *From what source/s do you get the books?*
- ✓ *Is the university's Online Libraries accessible to you?*
- ✓ *Are the websites of the university and related departments accessible to you?*
- ✓ *Do you think there is proper technology for writing and reading Bengali in Bangladesh*
- ✓ *How satisfied are you with digital accessibility in your educational institution?*

We conducted a survey with 71 respondents to understand the format in which their teachers provide reading materials in the classroom. The findings reveal diverse preferences.

28.77% of respondents exclusively receive hard copies. 12.33% reported receiving hard copy, JPG PDF. 24.66% indicated that they receive hard copy, PDF. 10.96% mentioned receiving hard copy, Doc file, PDF.

Surprisingly, 83% of respondents find softcopy materials inaccessible. Accessibility suggestions from respondents include: 56.76% suggested adding Braille format to enhance accessibility. 48.65% recommended using PDF format. 41.89% emphasized the importance of audio format. 20.27% added JPG PDF to their list of suggestions.

These insights highlight the need for a variety of accessible formats to accommodate the diverse needs of visually disabled students in higher education.

## Technological & Technological Devices

- ✓ *What kind of Technological Device do you use in your higher education?*
- ✓ *What types of technology do you use specifically in higher education?*
- ✓ *Do you have any problems using digital learning materials?*
- ✓ *If yes, what are the problems?*
- ✓ *Is there a need to take technology-based admission tests to solve the problem?*

In our survey of 71 visually disabled students in higher education, we explored the types of technological devices and assistive technologies they employ for their academic pursuits. Regarding technological devices, a majority of 57.53% identified as smartphone users, while 53.42% reported using both a computer and smartphone. Additionally, 39.73% mentioned using an audio recorder, and a smaller percentage, 2.74%, use a combination of Video Magnifier and laptop.

In terms of assistive technologies, the respondents shared insights on their preferences: Screen Reader was the most widely utilized assistive technology, with 76.34% of participants employing it. Text-to-Speech was used by a significant 53.42% of respondents to enhance their learning experience. Voice over Internet Protocol (VoIP) was employed by 38.71% of participants for educational purposes. Voice Recognition was incorporated by 24.73% of respondents into their academic routine. Read Aloud functionality was found beneficial by 10.75% of students. Screen Magnification was used by 11.83% of respondents to aid their studies. Braille Keyboards were reported by 1.08% of participants.

Furthermore, when asked about challenges with digital learning materials, approximately 45.16% of respondents expressed facing difficulties. These insights provide valuable information about the diverse technological preferences and challenges faced by visually disabled students in

higher education. Among the challenges they face, 69.01% mentioned a lack of knowledge in using equipment, unavailability of equipment, and a lack of necessary training. 14.08% highlighted issues with equipment availability and necessary training. 9.86% found the question not applicable. 4.23% indicated a lack of knowledge in using equipment as a problem. 2.82% provided other responses. About 56.67% of them expressed negative emotions regarding the requirement to take technology-based admission tests as a solution to the problem

## Teacher's Attitude in using Technology

- ✓ *Does the teacher support you enough in using technology?*
- ✓ *Do you think that your class teacher has a sufficient understanding of digital accessibility?*

In examining the experiences of visually disabled students in higher education, we probed their perceptions of teacher support and the adequacy of their teachers' understanding of digital accessibility. The findings reveal a nuanced landscape.

When asked about the level of teacher support in using technology, 46.58% responded with "Somewhat," indicating a moderate level of support. On the extremes, 22.03% felt they received minimal support, stating "Not at all," while only 1.49% expressed complete satisfaction with teacher support. Meanwhile, 7.46% acknowledged receiving "Most" support, suggesting a positive engagement with technology-enabled learning.

In terms of teachers' understanding of digital accessibility, a majority (61.02%) of students felt their class teachers had a reasonable grasp, responding with "Somewhat." However, 13.56% indicated a lack of understanding, responding with "Not at all." Another 15.25% considered their teachers to have a "Fairly" good

understanding, while a smaller 1.69% believed their teachers had a complete understanding.

These insights underscore the importance of fostering an environment where teachers are well-equipped to support visually disabled students in utilizing technology effectively, thus contributing to a more inclusive and accessible educational experience

## **5.2 Qualitative**

### **Cost of Assistive Technology**

The findings from the analysis of qualitative data indicate that visually disabled students in Bangladesh are significantly concerned about the expense of assistive technology. The focus group participants placed significant emphasis on the considerable financial obstacles that are linked to the acquisition of vital resources such as OCR software, Braille displays, Screen readers and Text-to-Speech (TTS) solutions. In the absence of a native TTS system and with existing tools being prohibitively expensive, economic accessibility concerns are more broadly recognized, emphasizing the necessity for cost-effective alternatives. The suggested course of action entails increasing consciousness among university administrators, guaranteeing universal access to digital resources, and offering technology products and services at a discounted or complimentary rate.

A participant summarized the situation, emphasizing the lack of an indigenous TTS system in Bangladesh and the reliance on paid tools, which hinders accessibility. Financial constraints prevent visually disabled students from purchasing instructional tools, prompting need for cost-effective alternatives and community-based projects. One person highlights the financial difficulty visually challenged students face, deepening the discussion. Assistive technology is specialised and often more expensive, as even a cheap smartphone may not meet their needs. The argument that a cheaper laptop without crucial accessibility capabilities is insufficient illustrates

the additional costs of customizing products to fit specific demands.

The presence of financial limitations in procuring specialized hardware and software was emphasized as a factor in the discrepancy in expenses between pupils with visual disabilities and those without. The participants' consensus indicated that comprehensive measures are required, such as systemic reforms, teacher and student training programs, institutional support systems, and increased awareness.

The findings emphasize the critical nature of addressing the financial obstacle in order to guarantee visually disabled students' equal opportunities for education. The viewpoint of the participant regarding the insufficiency of a standard laptop or smartphone for everyday use implies that focused interventions and financial assistance systems are required. The interviewee highlighted the need to provide financial support to visually disabled students for acquiring assistive technologies. This can be in the form of subsidies or grants to make these technologies more affordable and accessible.

### **Lack of training and support**

The interviews with key informants and focus groups shed light on the substantial obstacles encountered by visually disabled students in higher education, particularly with regard to the inadequate provision of training and assistance in the utilization of information technology. These difficulties are exacerbated by the absence of training and assistance; visually disabled pupils encounter difficulties in connecting devices such as smartphones and computers. The research finds that "visually disabled students cannot receive services, read books, use websites, access digital notice boards, use apps, or utilize digital libraries." In addition, the study highlights the significance of confronting the obstacle, which is a "lack of awareness," given that educational institutions and students alike might be uninformed regarding the assistive technologies that are readily accessible.

The difficulties in Bangladesh were additionally shed light on through the qualitative data analysis. A widespread fear of information technology among both educators and learners restricts the accessibility of computers and smartphones, particularly for those who are visually disabled. The absence of specialized, needs-based training was underscored, prompting a demand for personalized training initiatives.

There were expressed concerns regarding the provision of regular classes for visually disabled students. In response, workshops for educators and orientation programs for administrative personnel were proposed. The interviewee emphasized the importance of government participation and suggested allocated funds for practical training initiatives. The importance of examination challenges, the accessibility of educational materials, and the necessity for collaboration among the university, government, and relevant ministries were additional points that were emphasized. Both sources emphasize the critical nature of addressing the training and support gap for visually disabled students in higher education through the implementation of comprehensive measures, institutional reforms, policy modifications, and heightened awareness. They further underscore the significance of collaborative endeavors at both the local and national levels.

### **Lack of awareness and understanding**

The findings from the focus group discussion revealed a notable dearth of knowledge concerning the obstacles encountered by visually disabled students pursuing higher education. While acknowledging the beneficial effects of technology, participants expressed apprehensions regarding accessibility challenges. Specifically, difficulties associated with inaccessible course materials in image format were emphasized. Unanimous agreement was reached regarding the necessity to enhance awareness and provide training for students and instructors, particularly in technology-related competencies including

text-to-speech functionality, OCR software operation, and office application proficiency.

The subsequent discourse elaborated on these discoveries, uncovering a more extensive deficiency in educational system resources, teacher preparation, and institutional consciousness. The report underscored the financial obstacles faced by visually disabled students and expressed dissatisfaction with educators' inadequate comprehension of assistive technologies. Emphasis was placed on the necessity of implementing institutionalized measures, such as resource centers, teacher training programs, and policies tailored to persons with disabilities, in order to address the technological divide and ensure equal opportunities.

The interview provided further support for the theme of "lack of awareness and understanding." The interviewee highlighted a pervasive apprehension regarding information technology that exists among university instructors and learners in Bangladesh, thereby imposing further obstacles on students who are visually disabled. The lack of endeavors to acquaint visually disabled individuals with technology was conspicuous, underscoring the necessity for specialized training programs and collaborative initiatives between academic institutions and governmental bodies.

The interview underscored the scarcity of guidelines for educators regarding the provision of accessible educational materials, which forces visually disabled students to rely on manual processes. It was suggested that teachers, pupils, and administrative personnel receive early-stage training, and that language proficiency be enhanced through fundamental technology instruction. The study underscored the critical necessity for educational institutions to implement systemic changes, enhanced accessibility, and heightened awareness in order to effectively assist visually disabled students throughout their pursuit of higher education. Technological limitations and institutional

shortcomings were among the barriers that were identified, underscoring the critical need for a more comprehensive and knowledgeable approach.

### **Limited availability of accessible course materials**

The substantial obstacles encountered by Students with Visual Disabilities in higher education are underscored by the combined perspectives gleaned from FGD, interviews, and key informant interviews. Notably, these obstacles pertain to the limited availability of accessible course materials and technological barriers.

During the focus group discussion, participants brought attention to the significant concern regarding the restricted accessibility of course materials, specifically the inadequate quality of materials delivered in image format. During the Focus Group Discussion, a participant explicitly said "in many cases teachers provide many materials in image format. But it is very difficult for us to read any text from the image, in some cases it is impossible to read" Students with Visual Disabilities encounter substantial obstacles when instructional materials fail to account for accessibility, thereby impeding their academic advancement. They underscored the dearth of consciousness among educators regarding the particular requirements of visually disabled pupils, which has resulted in the development of instructional resources that do not cater to all users. The challenge is compounded by the lack of alternative accessible formats and the dependence on image-based content.

The implementation of information technology (IT) in academic settings presents challenges for Students with Visual Disabilities, including accessing textbooks, online resources, and class notes, and navigating international payment processes. Financial constraints make buying essential technology like smartphones and laptops a luxury for many people. Students with

Visual Disabilities face additional obstacles due to inadequate IT instruction.

The interviewee said course materials' limited accessibility is a major challenge for visually disabled college students. They said, "Not everyone has accessible devices, and Students with Visual Disabilities cannot receive services, read books in Braille, use websites, read digital notice boards, use apps, or utilize digital libraries." The hurdles include accessibility, financial constraints, and student and university administration ignorance.

The key informant interview unveiled that Students with Visual Disabilities encounter considerable obstacles when it comes to conventionally supplied hard copy materials featuring printed images. Although the accessibility of the university's application is recognized, the digital services as a whole do not adequately address the requirements of visually disabled users. To facilitate simple access to information, the interviewee suggested that the university's website designate a distinct section for visually disabled or Students with Disabilities.

These observations underscore the pressing necessity to confront technological obstacles and restricted accessibility for Students with Visual Disabilities. The suggested remedies endorse a comprehensive strategy that incorporates stakeholder engagement, technological advancements, training initiatives, and public awareness in order to bridge the accessibility divide in higher education. The results underscore the critical need for academic institutions to prioritize proactive strategies and cooperative endeavors in order to ensure that course materials are accessible to Students with Visual Disabilities, thereby promoting equal opportunities in higher education.

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### **Funding and Responsibility Allocation**

Interviews emphasize the reluctance to embrace technology, proposing comprehensive training programs. Technical issues and the absence of specialized training for Persons with Visual Disabilities remain obstacles. Digital solutions for educational materials and examinations are suggested, along with decentralizing resource centers. Collaboration between ministries is advocated for digital accessibility. University resource centers are deemed ineffective, and the hiring of visually disabled technology experts and modern assistive technologies are recommended. Non-governmental training programs can improve by aligning with global market demands and incorporating visually disabled-friendly

content. Classroom accessibility requires guidelines for content accessibility, teacher training, and inclusive e-learning content.

Focus group participants noted the lack of student and teacher training, material availability, and financial constraints. Institutional assistance, resource personnel, disability councils, and updated training curricula are suggested. In a focus group, technology advances, software training, and post-training support are stressed. Educational materials' inaccessibility and a desire to explore varied fields are barriers. The findings emphasize the need for finance and responsibility allocation to cooperatively address difficulties and empower visually disabled higher education students.

Insufficient financial resources, material accessibility, and teacher and student training were highlighted in the focus group discussion. Solutions include institutional assistance, resource staff, disability councils, and modified training curriculum. FGD emphasize technology advancement, software operation training, and post-training support. Lack of educational supplies and desire to study several subjects are difficulties. The results highlight the importance of assigning resources and responsibilities to overcome challenges and empower Students with Visual Disabilities in higher education

The interviews highlight a notable hesitancy to adopt technology and argue in favor of extensive training initiatives. Continue to be barriers are technical difficulties and the lack of specialized training for individuals with Visual Disabilities s. It is recommended to implement digital solutions for educational materials and assessments, in addition to the decentralization of resource centers. It is recommended that ministries collaborate in order to ensure digital accessibility. It is suggested that university resource centers employ modern assistive technologies and recruit technology experts with Visual Disabilities s, as they are considered to be ineffective. Enhancing

non-governmental training programs could involve integrating visually disabled-friendly content and conforming to the demands of the global market. Guidelines for web and content accessibility, teacher training, and inclusive e-learning materials are all components of classroom accessibility.

### **Collaboration for Digital Services**

The transformative experiences with technology that Students with Visual Disabilities disclosed during the focus group discussion on collaboration for digital services highlighted the transition from Braille to digital tools. The participants emphasized a wide range of applications, including voice notes, laptops, However, they also identified obstacles such as the lack of a Bangla text-to-speech system and the considerable financial investment required. Difficulties prevalent in higher education were deliberated, encompassing restricted access to resources and inadequate teacher knowledge, thereby underscoring the imperative for all-encompassing instruction. The issue of financial limitations and the digital divide among Pupils with Visual Disabilities were subsequently brought to light. The issue of inaccessible course materials prompted the suggestion of technology training, support centers, and policies pertaining to disabilities as potential solutions. The demand for the establishment of a disability council with the purpose of tackling distinct obstacles emphasized the importance of working together positively.

An interview delved deeper into opposition to the integration of technology in higher education in Bangladesh, proposing awareness programs, individualized training for Students with Visual Disabilities, and orientation for instructors.

The interviewee states, "The Department of Social Services and universities can enhance the quality of education for Students with Disabilities by coordinating student-friendly and technology-friendly work. The Ministry of ICT should ensure

easy digital accessibility for students with disabilities. allowing universities to access necessary support and funds without their own resources. This collaboration will expedite higher education for students with disabilities". The interview highlighted the importance of decentralization of support services, government assistance, and Ministry of ICT participation. Collaboration was emphasized as the difficulties of digital examinations, decent The also interviewee suggests collaborating with non-governmental organizations (NGOs) that specialize in providing support to individuals with Visual Disabilities. These NGOs can play a crucial role in developing and implementing training programs for both students and educators realizing resources, and integrating digital platforms were examined.

Barriers such as affordability, accessibility, and awareness were further emphasized in the key informant interview through the implementation of awareness campaigns, improved accessibility, and partnerships with mobile companies. By incorporating technology from the primary level, modifying training programs, and employing visually disabled instructors, proficiency issues were resolved. The importance of the government's involvement in promoting assistive technology initiatives and establishing web accessibility guidelines was underscored, shedding light on the complex obstacles and cooperative approaches required to ensure inclusivity for Students with Visual Disabilities in higher education.

### **Integrating University Resource Centers with Technological Support**

The interview highlights deficiencies in university resource centers catering to Students with Visual Disabilities, specifically attributing them to low attendance and a lack of comprehension. Hiring technological specialists who are visually disabled, adapting curricula, and integrating assistive technologies are some of the suggestions made,

The Interviewee said. "Students with Visual Disabilities may find it time-consuming and difficult to access resource centers in university. So, Decentralizing facilities to university libraries or department seminars could be beneficial and effective." is emphasized, leading to the suggestion that decentralization could improve accessibility. Urgent is a technological revolution that prioritizes accessible platforms.

The focal point of the focus group is the convergence of disability, technology, and education. Collective voices advocate for systemic changes—including the prioritization of teacher training, the integration of resource centers, and the implementation of accessibility measures. Based on personal experiences, the suggestions offer significant perspectives for educational establishments and policymakers to cultivate an all-encompassing atmosphere.

The research underscores the importance of incorporating technological assistance and promotes continuous advocacy, training, and progress. It is imperative that practical resources and training adequately tackle financial constraints. The discourse highlights deficiencies, advocating for educational reforms and investigations into ICT-facilitated learning.

### **Lack of self determination**

Concerning Students with Visual Disabilities in higher education, the focus group discussion and interview shed light on crucial issues, including a dearth of advocacy and autonomy. The suggested courses of action center on proactive measures by university administrations, such as organizing awareness campaigns, guaranteeing accessibility, and supplying economically viable technological solutions. It is emphasized that visually disabled instructors be integrated into teacher preparation programs in order to ensure effective technology education. Difficulties encountered in this context give rise to suggestions for specialized training initiatives.

To enable Students with Visual Disabilities in higher education to exercise greater autonomy,

advocacy, and institutional support, the study emphasizes the critical need for increased self-determination. These measures are of the utmost importance in order to surmount obstacles and guarantee fair and equal access to developments in information technology.

## **Others**

### **Digital exam system**

The interviewee elucidates on the obstacles that Students with Visual Disabilities encounter within the existing examination system and puts forth a revolutionary resolution. As per the interviewee, the current approach that requires the assistance of a scribe or writer presents challenges such as disengagement or writing difficulties. The proposed digital examination system involves digitizing the test taken by the student with Visual Disabilities, transforming it into an electronic copy, and subsequently submitting it for assessment. By eliminating manual processes, this novel methodology empowers Pupils with Visual Disabilities to engage in examinations autonomously. The proposed system demonstrates a dedication to promoting inclusivity by catering to the distinct requirements of individuals with Visual Disabilities and cultivating an educational setting that is more equitable.

### **Research and implementation**

The interviewee recognizes the indispensability of research and emphasizes the pivotal significance of governmental implementation in tackling these obstacles. "Research is the process of uncovering what we don't know, exploring the uncharted territories of knowledge, and illuminating the path to progress and innovation." Research entails venturing into uncharted domains of understanding, traversing uncharted spheres of information, and ultimately illuminating the path to progress and innovation. This expedition endeavors to reveal concealed

realities and make a valuable contribution to the wider fabric of human comprehension.

### **Barriers to study Science and Commerce**

Challenges confronted by Students with Visual Disabilities pursuing studies in science and commerce were explained by participants in the FGD. A participant commented, "There's a lack of consideration for Students with Visual Disabilities in class materials, hindering our engagement with science topics." A different individual stated, "Inaccessible class notes and presentations make it challenging to grasp complex commerce concepts." The discourse unveiled the necessity for specialized equipment and extensive instruction in order to surmount technical obstacles; one participant put it succinctly: "We advocate for greater inclusivity in the realms of science and commerce." These observations emphasize the significance of tackling accessibility concerns within particular academic fields in order to guarantee equitable educational opportunities for Students with Visual Disabilities.

## **5.3 Focus group discussions**

The focus group discussions (FGD) focused on the technological interactions and experiences of Students with Visual Disabilities in higher education. Participants expressed positive experiences with technology, but perceived a lag in comparison to conventional developments. They highlighted challenges like lack of Text-to-Speech functionality and high costs of reading applications. They emphasized the need for teacher training and specialized education-oriented training. They also discussed the transformative influence of technology on Students with Visual Disabilities, but expressed concerns about insufficient assistance, lack of instruction, and financial limitations. They advocated for institutional support and continuous instruction to create efficient IT-enabled learning environments.

## **5.4 Key Informant Interview**

The interview explores the challenges faced by Students with Visual Disabilities in higher education in Bangladesh, focusing on accessibility, affordability, awareness, and linguistic barriers. Solutions include raising awareness, providing cost-effective technology, collaborating with Universities, Government, NGOs, Technology companies and mobile companies, and standardizing digital services. To improve technological proficiency, technology education should start at the elementary level, with teacher training, adapted digital literacy courses, and technology products featuring visually disabled instructors. Resource centers should employ technology specialists, develop individualized curricula, and incorporate assistive technologies. Comprehensive training programs for Students with Visual Disabilities and instructors, along with decentralizing services and implementing separate segments for notices and digital services, are suggested. A methodical strategy is needed to address these issues.

## Chapter 6 Findings

### 6.1 Quantitative Data Findings:

- 1. High Cost of Assistive Technology:** Obtaining technology for higher education is out of reach for a large percentage of Students with Visual Disabilities, especially those whose monthly household income falls between 10001-20000 BDT (52.11%). This signifies a significant obstacle to obtaining assistive aids.
- 2. Training:** Around 89.74% of participants have undergone technical training, with the majority acquiring it from non-governmental organizations (50%). Nevertheless, a mere 60% of individuals perceived the instruction as advantageous for their advanced studies. In addition, 97.18% of respondents indicated that their universities lacked training

programs specifically designed for individuals with Visual Disabilities.

- 3. Reading Materials Accessibility:** The majority (83%) of respondents found it difficult to access reading materials in digital format, highlighting the importance of providing diverse accessible forms such as Braille, PDF, and audio.
- 4. Special Training for Visually Disabled:** All respondents (100%) acknowledged the necessity of technological training in order to expedite their further education. The high level of dissatisfaction (66.20%) with the existing information technology in Bangladesh indicates a need for more targeted and extensive training programs.
- 5. Resource Center:** Highlighting a deficiency in institutional assistance. Out of the individuals who had the opportunity to utilize a Resource center, 64.79% reported discontentment, attributing their unhappiness to obstacles such as inadequate resources and unsuitable materials.
- 6. Classroom Management:** Around 70.99% of participants encounter difficulties in finishing technology-oriented coursework or assignments. Approximately 60.56% of individuals consider technology to be moderately accessible in the classroom, while 32.39% regard it as completely inaccessible. The primary factors contributing to low accessibility include the unavailability of accessible reading materials (92.96%), inadequate instructor proficiency (91.55%), and technological obstacles (88.73%).
- 7. Device Preferences:** substantial majority (67.95%) exclusively depends on smartphones for educational purposes, underscoring the necessity for solutions that are compatible with mobile devices.
- 8. Training and Technical Support:** Approximately 89.74% of participants underwent technical training, although only

60% perceived it as beneficial for their higher education, suggesting possible deficiencies in the efficacy of existing training programs.

- 9. University Training Programs:** A significant majority of 97.18% of respondents indicated that their universities lack training programs, indicating a noteworthy absence of such activities.
- 10. Resource Center:** Among individuals who had access to a Resource center, 64.79% expressed dissatisfaction with the support provided, indicating possible difficulties in meeting the specific requirements of Students with Visual Disabilities.
- 11. Technology itself barrier:** A significant 35.21% of participants consider technology to be an obstacle to pursuing higher education, highlighting the necessity for customized remedies. Additionally, 53.52% face barriers in using technology due to language-related issues.
- 12. Admission Process Challenges:** A substantial 96.56% were unable to complete university admission applications themselves, with 62.31% finding the online admission process inaccessible. The challenges in the admission process include non-availability of scribes (52.56%) and issues related to the online platform's accessibility.
- 13. Technology & Technological Devices:** Regarding technological devices, 57.53% use smartphones, 53.42% use both computers and smartphones, and 39.73% use an audio recorder. The most widely utilized assistive technology is the Screen Reader (76.34%). Challenges in using digital learning materials are reported by 45.16%, with the majority citing a lack of knowledge and training.

## 6.2 Qualitative Data Findings:

- 1. Cost of Assistive Technology:** Students with Visual Disabilities in Bangladesh encounter substantial difficulties as a result of the

exorbitant expenses associated with assistive equipment and the lack of a built-in Text-to-Speech (TTS) system and the high cost of available tools raise issues over economic accessibility.

- 2. Insufficient training and support:** Lack of adequate training and support poses considerable obstacles for students with visual disabilities in higher education. This problem involves challenges in establishing connections between devices, gaining access to digital information, and making use of assistive technologies. Significantly, there is a deficiency in training for both students and teachers about the proficient utilization of assistive technology.
- 3. Need for Cost-Effective Alternatives:** In order to reduce the financial challenges faced by Students with Visual Disabilities, participants draw attention to the necessity of cost-effective alternatives and community-based initiatives. This includes incentives, subsidies, or special prices for assistive technology.
- 4. Insufficiency of Standard Devices:** The qualitative data highlights the fact that even common devices like computers or smartphones would not be able to satisfy the specific needs of Students with Visual Disabilities, highlighting the additional costs involved in ensuring that products fulfil their requirements.
- 5. Inadequate awareness and understanding:** University administrators and teachers are unaware of the academic challenges experienced by students with visual disabilities. Understanding and acknowledging these issues is vital. Unattainable educational materials and an insufficient understanding of assistive technologies are two of the challenges that must be overcome.
- 6. Insufficient Resources:** The availability of necessary IT equipment is hindered by

financial limitations, which causes to the inequities in Students with Visual Disabilities 'technological abilities. One observation is the absence of resource centers and teachers with expertise in teaching Students with Visual Disabilities.

7. **Limited Availability of Accessible Course Materials:** Students with Visual Disabilities face significant obstacles because there aren't enough accessible course resources available. The challenges include inadequate quality of materials delivered in image format, lack of awareness among educators, and dependence on image-based content.
8. **Collaboration for Digital Services:** Students with Visual Disabilities experience transformative benefits with technology, highlighting the transition from Braille to digital tools and the challenges include the lack of a native text-to-speech system and financial constraints. Department of Social Services, universities, and Ministry of ICT collaboration. It improves education for students with disabilities by using student-friendly and technology-friendly methods, ensuring digital accessibility, and involving visual disability NGOs in training and resource integration.
9. **Digital Exam System:** The existing examination systems provide difficulties for Students with Visual Disabilities, indicating the necessity for a digital examination system.
10. **Lack of Self-Determination: Students with Visual Disabilities** experience a lack of support and independence in higher education. Targeted students may face challenges due to lack of training programs to improve self-determination.
11. **Research and Implementation:** Emphasize the importance of conducting research and implementing government policies to address challenges. There is a lack of resourceful

study available to unveil hidden truths and human understanding.

These findings clearly emphasize the various challenges faced by Students with Visual Disabilities in using technological aids and the need for extensive interventions, awareness campaigns, and working together to overcome the accessibility barrier in higher education.

## Chapter 7 Recommendation

- Allocate resources towards developing and incorporating inclusive educational materials, including tools like screen readers, audio descriptions, and tactile graphics to improve the educational experience for Students with Visual Disabilities.
- Implement comprehensive training programs for educators to equip them with the skills and knowledge needed to create and deliver accessible learning resources for students with visual disabilities.
- Develop and execute training programs aimed at both university teachers and students with visual disabilities. These programs should cover the use of assistive technologies and strategies for effective learning.
- Establish university resource centers staffed with experts in technology and resources for individuals with visual disabilities. These centers could offer customized programs to cater to the unique needs of students in Bangladesh.
- To improve accessibility and convenience for Students with Visual Disabilities in different academic fields, it is recommended to distribute resource centers and include technology support into university resource centers.
- Establish dedicated sections on university websites and libraries that cater to the needs of Students with Visual Disabilities, guaranteeing convenient access to information and resources in forms that are compatible with assistive technologies.

- Encourage universities to contribute to the establishment of best practices and standards through academic research. This research has the potential to provide valuable insights for the formulation of policies and recommendations that can have a positive impact on the wider community.

- Incorporate courses on accessible technology into university curricula, ensuring that all students get education and training in the latest innovations, promoting inclusivity.

- Adapt accessible training curricula to align with international standards and market demands, ensuring that students with visual disabilities are equipped with skills relevant on a global scale.

Advocate for governmental assistance in implementing programs that offer tailored instruction to individuals with visual disabilities, equipping them with the necessary skills to proficiently interact with technology and seamlessly integrate into the digital educational sphere.

- Organize awareness initiatives to emphasize the difficulties encountered by Students with Visual Disabilities in higher education, promoting comprehension and assistance from the academic community and society as a whole.

- Advocate for increased financing and responsibility allocation from relevant authorities to address the challenges faced by students with visual disabilities collaboratively.

- Investigate measures aimed at ensuring compliance with accessibility standards in educational institutions, thereby developing an inclusive environment for Students with Visual Disabilities.

- Give priority to promoting advocacy and self-determination strategies for Students with Visual Disabilities, empowering them to actively participate in shaping their educational experiences.

- Encourage and facilitate research in the field of ICT-enabled learning to enhance educational settings for Students with Visual Disabilities.

Promote the implementation of research findings by government agencies.

- Collaborate with technology companies to develop and make available cost-effective assistive technology solutions tailored to the specific needs of students with visual disabilities in Bangladesh.

- Promote government incentives, such as tax exemptions, financial grants, or subsidies, to stimulate the commercialization of assistive technologies, hence promoting innovation and increasing their accessibility in the market.

Facilitating cooperation between institutions, government entities, and technology firms is crucial to narrow the digital gap for Students with Visual Disabilities in higher education in Bangladesh. Through collaboration, these parties can collaboratively improve technological skills, establish inclusive policies, and generate inventive solutions customized to the specific requirements of Students with Visual Disabilities, thereby promoting a more accessible and supportive educational setting.

- Future research can be guided by addressing potential limitations in the current situation and offering solutions.

## Chapter 8 Conclusion

In conclusion, the study underscores the growing opportunities for Persons with Visual Disabilities in Bangladesh's IT sector, driven by innovations in technology, inclusive policies, governmental initiatives, and specialized training programs. The findings section, supported by both quantitative and qualitative data, unveils the financial challenges, device preferences, and barriers faced by students with Visual Disabilities in higher education. The recommendations put forth a comprehensive set of strategies, panning accessible course materials, teacher training, resource centers, and awareness campaigns, aiming to create an inclusive and supportive environment for students with Visual Disabilities.

The recommendations put forth a holistic approach to address these challenges, ranging

from investing in accessible course materials and comprehensive training programs for educators to the establishment of university resource centers and innovation hubs dedicated to assistive technology. Integration of accessible technology courses into curricula, advocacy for government support, financial incentives, and adherence to accessibility standards are crucial steps toward creating an inclusive environment.

In essence, by addressing the identified barriers and utilizing the potential of technology, education, and collaborative initiatives, the goal

is to empower Persons with Visual Disabilities to navigate the challenges, contribute meaningfully to society, and shape a more inclusive and accessible future. Ultimately, the research findings and recommendations serve as a roadmap for stakeholders—government entities, educational institutions, technology companies, and the broader society—to collaborate and take concerted actions. By implementing these recommendations, we can aspire to bridge the accessibility gap, empower students with Visual Disabilities, and foster a more inclusive higher education landscape in Bangladesh.

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**Appendix**

**Survey Questionnaire**

**Name:**

**Age:**

**Male/ Female**

- 1. Personal monthly income
  - Not Applicable
  - >10,000
  - 10,000-20,000
  - 20,000-30,000
  - <30,000
- 2. Monthly household income
  - Not Applicable
  - >10,000
  - 10,000-20,000
  - 20,000-30,000
  - <30,000
- 3. Educational Institution .....
- 4. Education Level
  - Graduate
  - Post Graduate
  - Others
- 5. Type of disability-
  - Speech Disability
  - Autism spectrum disorders
  - Physical Disability
  - Mental Illness leading to Disability
  - Visual Disability
  - Hearing Disability
  - Deaf Blindness
  - Cerebral Palsy
  - Down Syndrome
  - Multiple Disability
- 7. Degree of Disability-
  - Blindness
  - Partial Blindness
  - Low Vision
- 8. Subject .....
- 9. Do you use any types of technology in Higher Education?
  - Yes
  - No
- 10. If not, why?
  - Financial Problems

- Difficulty in Transportation to Training Centers
  - Lack of Suitable Training Centers
  - Lack of Proper Information
  - Others
11. If yes, what digital devices do you own?
- Smart Phone
  - Laptop
  - Desktop
  - Audio Recorder
  - Assistive Device
  - Note Book
  - Others
12. Are you having financial difficulties in purchasing digital devices?
- Yes
  - No
13. What kind of Technological Device do you use in your higher education?
- Smart Phone
  - Computer
  - Audio Recorder
  - Braille Display
  - Portable Video Magnifier
  - Others
14. What types of technology do you use specifically in higher education?
- Voice over Internet Protocol
  - Text-To-Speech
  - Voice Recognition
  - Read Aloud
  - Braille keyboards
  - Screen Magnification
  - Others
15. Do you have any problems using digital learning materials?
- Yes
  - No
16. If yes, what are the problems?
- Lack of Knowledge (how to use equipment)
  - Lack of necessary training
  - Equipment not Available
  - Others
17. Have you received any technological training?
- Yes
  - No
18. If No, why?
- Financial Problems
  - Lack of Suitable training Centers
  - Lack of Proper Information
  - Difficulty in Transportation to Training Centers
  - Others
19. Where did you receive the training?
- Government

- NGO
  - Private
  - Private Tutor
20. Is the training you received useful for your higher education?
- Yes
  - No
21. If not, why?
- Lack of Well Trainer Resource Person
  - Lack of Accessible Training Material
  - Irregularity During Training
  - Equipment Malfunction
  - Others
22. If yes, what kind of difference did you notice before and after the training?
- No difference
  - Some Difference Found
  - Substantial difference found
23. Does your university have any training programs?
- Yes
  - No
24. If yes, is this training useful for your higher education?
- Very Less Useful
  - Less Useful
  - Useful
  - Very Useful
  - Very More Useful
25. If not, is there a need for such training from the university in the case of higher education?
- Yes
  - No
26. Does your university have a technical support center?
- Yes
  - No
27. If yes, is the support you get there adequate for your education?
- Yes
  - No
28. If No, why do you think such support is not sufficient?
- Lack of resources
  - Lack of trainers
  - Lack of suitable materials
  - Equipment Malfunction
  - Others
29. Did you manage to complete the university admission application yourself?
- Yes
  - No
30. If yes, was the application process accessible to you?
- Yes
  - No
31. If not, how did you complete the application?
- From Computer shop
  - With help from friend
  - With help from teacher

- Family Member
- Others
32. How did you take the admission test?
- Scribes (Writer)
- Digital Device
- Others
33. Have you faced any kind of problem in participating in the admission test?
- Yes
- No
34. If yes, what kind of problems did you face?
- Non-availability of Scribes (Writer) on time
- Non-obtention of Scribes (Writer)
- Non-arrival of Scribes (Writer) on time at examination hall
- Others
35. Is there a need to take technology-based admission tests to solve the problem?
- Yes
- No
36. Was the university's online admission process accessible to you?
- Yes
- No
37. Did you get any kind of help from your university authority in the online admission process?
- Yes
- No
38. If not, what kind of assistance be provided?
- With information
- Making the online platform of the admission process accessible
- Hiring skilled manpower
- Facilitating the process
- Others
39. Can you do technology-based classwork or assignments like your classmates?
- Yes
- No
40. Is it accessible to you if the teacher teaches through technology in the classroom?
- Not at all
- Somewhat
- Fairly
- Mostly
- Completely
41. What are the reasons for not being fully accessible?
- Teacher's incompetence on accessibility
- Inaccessible Technology
- Teacher's negligence
- Inaccessible reading materials
- Others
42. In what format does the teacher provide reading materials in the classroom?

- Hardcopy
- JPG PDF
- Doc File
- PDF
- Others

43. Are the reading materials provided by the teacher (soft copy) to you in an accessible format?

- Yes
- No

44. If not, in what format would it be accessible to you?

- Hardcopy
- JPG PDF
- Doc File
- Braille
- Audio Format
- PDF
- Others

45. Do you get the necessary books for higher education in online or digital format?

- Not at all
- Somewhat
- Fairly
- Mostly
- Completely

46. From what source/s do you get the books?

- Teachers
- Online Libraries
- Social Media
- Government Institution
- E Learning Portal
- NGOs or Private Institution
- Others

47. Are the websites of the university and related departments accessible to you?

- Not at all
- Somewhat
- Fairly
- Mostly
- Completely

48. Does the teacher support you enough in using technology?

- Not at all
- Somewhat
- Fairly
- Mostly
- Completely

49. Do you think that your class teacher has a sufficient understanding of digital accessibility?

- Not at all
- Somewhat
- Fairly

- Mostly  
 Completely
50. Is the existing examination system in higher education suitable for you?
- Not at all  
 Somewhat  
 Fairly  
 Mostly  
 Completely
51. Which method of participating the examination will be useful for you?
- Not at all  
 Somewhat  
 Fairly  
 Mostly  
 Completely
52. Do you face any barriers to using technology due to language?
- Yes  
 No
53. Are there institutional or government incentives or loans for purchasing digital devices?
- Not at all  
 Somewhat  
 Fairly  
 Mostly  
 Completely
54. Is the current information technology in Bangladesh sufficient for you in higher education?
- Not at all  
 Somewhat  
 Fairly  
 Mostly  
 Completely
55. What kinds of technological tools can be available to assist you in your pursuit of higher education? .....
56. Do you think there is proper technology for writing and reading Bengali in Bangladesh?
- Yes  
 No
57. How satisfied are you with digital accessibility in your educational institution?
- Not at all  
 Somewhat  
 Fairly  
 Mostly  
 Completely
58. Do you think you need any training in technology that can accelerate your higher education?
- Yes  
 No
59. If yes, what kind of training do you think is needed? .....
60. Is technology a barrier to higher education for visually disabled students?
- Yes  
 No

**Thank you for your valuable**