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Bridging the Digital Divide: Challenges and Opportunities of ICT in Higher Education in Bangladesh

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ABSTRACT

Purpose of the study: This study aims to assess the current state of Information and Communications Technology integration in higher education institutions in Bangladesh, identifying major challenges, disparities, and opportunities for creating an inclusive and competitive digital learning environment.

Methodology: This study used a qualitative review method based on secondary data, including policy documents (Digital Bangladesh Vision 2021, National ICT Policy 2018), institutional reports, and research articles. Data were analyzed using thematic content analysis.

Main Findings: Information and Communications Technology adoption in Bangladeshi higher education remains uneven. Public universities in rural areas face infrastructure gaps, unstable internet, and power shortages, while private urban institutions perform better. Faculty lack Information and Communications Technology training and motivation, and students experience sharp digital, economic, and gender disparities. COVID-19 accelerated Information and Communications Technology use but exposed existing inequalities.

Novelty/Originality of this study: This study uniquely connects Information and Communications Technology integration with issues of equity, regional disparity, and pedagogical readiness in Bangladesh. It advances knowledge by highlighting how digital transformation can promote inclusive higher education and strengthen national competitiveness in the emerging knowledge economy.

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1. INTRODUCTION

One of the fundamental forces behind social and economic progress is education, and preserving a nation's competitiveness in the global economy requires prioritizing higher education. Universities must update their systems and practices in response to the problems of the twenty-first century [1]. Information and communications technology (ICT) is among the changes that bring an additional source of challenge and pressure. There is a global educational policy and research movement that attempts to recognize the imperative of reimagining education from traditional paradigms of learning and teaching toward more innovative frameworks of pedagogical practice [2]. These fields of practice and areas of transformation are typically described in terms of information or knowledge society, emerging pedagogy and 21st-century skills [3]. Around the world, there is a growing demand for higher education. Universities and governments are searching for innovative approaches to expand access to higher education while raising the caliber of their curricula. In this sense, the use of ICT in higher education is being taken extremely seriously by governments and educational systems worldwide.

The use of ICT in teaching and learning is unavoidable. The ICT significantly contributes to modern education, especially in developing nations like Bangladesh [4]. Technology significantly influences education, particularly in Bangladesh, where there are both barriers and possibilities in the application of ICT in higher education [5]. Traditional teaching methods are still common, but using ICT can make learning more interesting and help students understand better and do well in their studies by creating interactive classrooms [6]. In Bangladesh, the government is trying to bring technology into universities, but there are problems like lack of teacher training, not enough digital tools, and poor infrastructure [7].

Most pupils are observed to be highly enthusiastic regarding the online courses. They are enthusiastic about engaging and interacting on online platforms, which are somewhat restricted within traditional classroom environments. However, numerous institutional, administrative, and technical challenges hinder the implementation of e-learning in Bangladesh [7].

According to Ashrafuzzaman et al., there are major advantages in terms of cost-effectiveness, flexibility, self-paced learning, and international networking opportunities, which enhance access and learning chances for students from marginalized or remote places. However, the findings highlight some important problems that hinder the success of online learning, including reliance on technology, inappropriate learning environments, social isolation, and delayed feedback. These difficulties support the urgent need for significant investment in the digital infrastructure of reasonably priced technology access and blended learning approaches, which combine online and offline resources to accommodate learners' various demands. Better learning outcomes are a result of enhanced feedback systems, the creation of online communities for collaboration, and the growth of digital literacy in both students and teachers [8].

According to Chowdhury and Behak, there are several issues with establishing online higher education, including the nation's digital divide and the unfavorable opinions of parents, students, and instructors toward the program. However, online or at least blended learning can be a good substitute for in-person higher education in Bangladesh, which faces several obstacles like a shortage of seats and reputable institutions, backlogs in sessions, the expense of university education, and favorable elements like digitalization, digital literacy, and the pervasive use of mobile phones and the internet [9].

Bangladesh, as a developing country with high demographic pressures, has its own challenges in making its higher education system competitive and inclusive. Bangladesh has over 160 million people, and since many of them are young, the need for higher education is growing fast [10]. The government has placed high emphasis on digitalization with visions such as Digital Bangladesh Vision 2021 and the National ICT Policy 2018 that focus on ICT integration in education [11], [12]. Despite progress, Bangladesh's universities face numerous challenges, including infrastructural constraints, lack of teachers' training, scarcity of resources, and disproportionate access between rural and urban areas [13], [14].

This paper discusses the two-fold dimensions of ICT challenges as well as opportunities in higher education in Bangladesh. It identifies structural gaps, institutional weaknesses, and socio-economic disparities, as well as discusses innovative strategies, governmental initiatives, and international lessons that can be translated to the Bangladeshi situation.

The study aims to give practical recommendations to policymakers, administrators, and educators to bridge the digital divide and improve the country's higher education system. In the post-COVID setting, this study is unique in its synthesis of institutional practice, policy, and equity issues. Its importance stems from Bangladesh's increasing digitalization, where insufficient research could exacerbate educational disparities rather than promote inclusive ICT-driven growth.

2. RESEARCH METHOD

A qualitative research design with a structured literature review as a methodology, which was perfectly apt for knowledge consolidation and identification of patterns from literature, was employed in this research. Rather than generating further data, this research chose to rely on literature for a critical analysis of Information and Communications Technology (ICT) integration in tertiary education in Bangladesh, with a structured set of parameters in line with established literature review methodologies in qualitative research studies [15].

The review involved documents that are immediately relevant to ICT in higher education. These are policy documents such as Digital Bangladesh Vision 2021 and National ICT Policy 2018, and literature from peer-reviewed sources for analyses related to ICT-based pedagogy, preparedness, governance, and equity. There are also comparative studies from South/Southeast Asia that are aligned with nations including Malaysia, India, and Sri Lanka. The unit of analysis would involve substantive studies, with a focus on infrastructure, governance, faculty preparedness, and access.

The gathering of data was done in a way where source selection criteria were followed in order to make it credible, relevant, and from contemporary sources. The majority of this data was gathered between 2010 and 2024, but other sources were considered if necessary. Only those sources that were relevant to ICT integration, inequality and technology, pedagogical approaches, and the governance of higher education institutions were

used, with a priority on official sources. A structured document review matrix was used where all sources were placed.

The data analysis employed the technique of thematic content analysis [16]. This involves a series of readings, coding, identifying themes, refining, and synthesizing. These are done in four stages, which include planning, data gathering, analysis of data, and writing. This enhances rigor in methodology, forming a comprehensive understanding of ICT adoption among higher education institutions in Bangladesh.

3. RESULTS AND DISCUSSION

This study shows a mixed picture of how ICT is used in higher education in Bangladesh. The government and universities have taken steps to bring more digital teaching and learning, but there are still many problems that stop these efforts from working fully. The results are explained in different parts, showing both what has been done and what still needs to improve.

3.1. *Policy Frameworks and Institutional Initiatives*

The GoB has consistently emphasized the role of ICT in higher education by making it a part of its national development plans and strategic visions. Digital Bangladesh Vision 2021 produced a broad framework for the development of digital tools and materials across all sectors, including education [17]. The University Grants Commission (UGC) has played a leading role in ICT-related initiatives [18]. The establishment of the BdREN. which connects public universities to a high-speed internet backbone, is one such success story. BdREN facilitated collaborative research, access to e-libraries, and access to online courses across public universities. Similarly, universities have begun installing computer management systems, such as online admission sites, electronic libraries, and automated result announcement systems.

Another big issue is governance and management. Bangladesh has strong plans like the National ICT Policy 2018 and the Digital Bangladesh vision, but universities often face problems like weak coordination, low budgets, and too much bureaucracy. Universities also cannot take their own decisions about ICT because they depend on UGC and the Ministry of Education for money and rules [19]. This centralization slows down the process of innovation and prevents context-based solutions at the institutional level. Conversely, in Malaysia, universities enjoy greater autonomy in designing their ICT plans, which allows them to establish partnership with the private sector and adapt international models to local needs. To achieve substantial advancements, Bangladesh must strike a balance between centralized policy direction and decentralized institutional autonomy.

Despite these attempts, ICT adoption remains uneven in its reach. Major universities located in Dhaka, Chittagong, and other major urban areas are more likely to start ICT-driven change, compared to many regional and smaller private colleges. This discrepancy is a proxy for wider socio-economic variations in the country and reflects the inability of a top-down policy exercise without adequate localized momentum.

3.2. *Infrastructural Developments and Gaps*

Infrastructure forms the cornerstone of higher education ICT uptake, but it is one of the weakest sectors in Bangladesh [20]. While internet connectivity has expanded in recent years, most universities still face slow, unstable, and costly connections. Public universities, especially in rural or semi-urban areas, suffer from power outages that disrupt online learning and administrative operations [21]. Computer laboratories, multimedia rooms, and modern teaching equipment remain limited across institutions, often restricted to a small number of departments [22]. This infrastructural shortage lies at the root of many systemic problems [23]. Although Bangladesh has invested in broadband expansion and digital infrastructure through initiatives such as BdREN, the reality for most universities outside Dhaka and other major urban centers remains substandard. Regular power outages, slow internet, and limited computer lab availability significantly undermine universities' capacity to integrate ICT into teaching and learning. This situation is worsened by institutions' dependence on short-term, donor-funded projects that lack sustainability. Without long-term, state-funded investment ensuring equitable infrastructure development nationwide, ICT use in higher education may continue to reinforce rather than reduce existing disparities.

Private universities have generally excelled in investing in digital infrastructure, partly due to their access to revenues from tuition fees [22]. Dhaka university students, for instance, are generally provided with easily accessible computer labs, safe Wi-Fi services, and virtual classrooms [19]. These amenities are not equally available everywhere. The urban-rural divide results in radically divergent learning opportunities for students depending on where they go to university.

3.3. *Faculty Readiness and Capacity Development*

Another significant determinant of ICT integration is faculty readiness. While younger faculty members are more inclined towards the use of technology tools, older academicians remain reliant on the conventional lecture-oriented pedagogy [24]. Professional development programs related to ICT are scarce and intermittent, typically presented as stand-alone one-time training sessions without proper follow-up. Thus, while some faculty

members are able to integrate PowerPoint slides, online platforms, or learning management systems (LMS) into instruction, others merely implement ICT superficially [25].

Lack of institutional reward also discourages faculty from adopting pedagogic innovations [26]. Career advancement and promotion in most universities are tied to research output rather than pedagogical innovation [27]. This denies the motivation of the teachers to invest time in learning computer tools and revising their pedagogy. Thus, ICT is far from being exploited in its full potential as a pedagogical transformation agent but adopted only in limited ways as part of higher education.

Another priority area is pedagogical practices. Tertiary education in Bangladesh has traditionally been dominated by lecture-based methods that focus on rote memorization over critical thinking and problem-solving [24]. ICT offers an opportunity to shift toward interactive and student-centered learning, yet most lecturers remain reluctant or lack the skills to abandon traditional teaching methods. Limited training opportunities also contribute to this problem. Experiences from Malaysia and India show that ongoing professional development, reinforced by institutional rewards for teaching innovation, is necessary to integrate ICT effectively into tertiary education [28]. In Bangladesh, where promotions among faculty are tied more closely to research outputs than to teaching innovation, there is less incentive for faculty to invest time in learning digital technologies [29]. The result is that ICT is used as an add-on e.g., using PowerPoint slides in class rather than as a transformative force in curriculum design.

3.4. *Student Access, Digital Divide, and Gender Inequality*

The students in Bangladesh have very unequal access to ICT infrastructure [27]. Students from urban, middle-class, or wealthy households are more likely to own laptops, mobile phones, and have access to stable internet [30]. Students from rural or poor socio-economic backgrounds tend not to keep up with ICT-based learning because they lack devices and the financial ability to afford data bundles. This void was particularly conspicuous when the COVID-19 pandemic led universities to move to online learning [31]. Enormous segments of the student population were excluded from online lectures because they lacked smartphones, lacked internet access, or lived in areas where there was poor network coverage. The harmony of the online learning process can be harmed by frequent developing nation pathologies [32]. These include inadequate technological infrastructure development, device or internet usage limitations, and economic constraints. Teachers and pupils are experiencing a great deal of stress and psychological stagnation as a result of the lack of computer literacy.

Its gender dimension should also be taken into account. Female students have additional barriers to using ICT, such as cultural restrictions on the use of digital media and lower prioritization of their learning requirements by families [31]. These gender dynamics reinforce prevailing inequalities and shatter the inclusive potential of ICT in higher education.

3.5 The Impact of the COVID-19 Pandemic

The issue of access, particularly for students, underscores the deep-seated socio-economic disparities that underlie the higher education system. Those students who come from more affluent, urban families enjoy far greater access to devices and connectivity, whereas their poor or rural counterparts fall behind. The COVID-19 pandemic made this gap most glaringly obvious: while some students adjusted to online learning with laptops and broadband connections, others dropped off entirely because they didn't have smartphones or had to share a single phone among multiple family members. This gap raises urgent questions about the inclusivity of ICT-based reforms. If technology becomes a new gatekeeper of opportunity, it can end up exacerbating educational inequality rather than serving as a bridge. Similar problems were seen in India, where many rural students could not join online classes during the pandemic even though the government had spent a lot on ICT. Bangladesh should learn from this and focus on giving subsidies, free or low-cost devices, and better internet in rural areas so that the same problems do not happen again.

The COVID-19 pandemic made universities in Bangladesh start using ICT faster because they had to move to online classes almost overnight [33]. Universities that already had online systems or BdREN internet connection managed better, but others faced problems in continuing classes [34]. This sudden change showed many weaknesses in internet and technology access, but it also proved that ICT is very important for keeping education going during crises. Because of this, many universities decided to keep hybrid or blended classes even after reopening, which shows a slow cultural shift toward digital learning. Still, the pandemic also revealed that not all students had the same opportunities, highlighting the digital divide again.

Girls face even more challenges in using technology. Many families in Bangladesh give more importance to boys' education, so they buy devices and internet for sons but not for daughters. Social rules also sometimes stop women from freely using digital tools, which makes it harder for them to join online learning or digital group work [35]. For this reason, ICT use in universities should be fair for both men and women. Programs like giving devices to girls, creating safe online spaces, and setting up mentoring can help reduce these gaps [36].

3.6 Emerging Innovations and Best Practices

Despite the challenges, there are examples of innovation that show the potential ICT can bring to higher education in Bangladesh. Some universities have developed e-learning platforms that include recorded lectures,

reading, and online examinations [36]. Others have collaborated with international platforms to provide MOOCs, thereby making global-quality material accessible to students [37]. Digital libraries, research databases, and journals have also been created in many institutions, significantly improving access to scholarly resources. These innovations are, however, only available in a handful of universities and only for students undertaking specific programs. To scale such practices, institutional effort is not enough but also far-reaching structural reforms and frequent government intervention.

ICT can increase Bangladeshi graduates' employability. Digital skills, from fundamental computer literacy to more complex abilities in coding, data analysis, and digital communication, are becoming more and more in demand in the work market. Universities can better match graduates with the demands of the domestic and global labor markets by integrating ICT into their curricula [38]. Such potential is particularly relevant for Bangladesh, which is a labor migration and outsourcing-based nation with sectors such as information technology-enabled services (ITES) being prime industries. Better ICT skills would not only increase the international competitiveness of Bangladeshi graduates but also serve the economic aspirations of the nation as a whole. The integration of digital technologies without addressing pedagogical, access, and inclusivity issues threatens to reduce ICT to a cosmetic reform [11]. Instead, universities must view ICT as a means to enhance critical thinking, collaborative learning, and global interconnectedness for students. This calls for a cultural shift at all levels: policymakers must design inclusive policies, administrators must make long-term commitments, faculty must embrace a culture of ongoing learning, and students must be supported equitably to access digital resources. Only then can ICT fulfill its potential in closing the digital divide and making higher education in Bangladesh a more inclusive and globally competitive system.

Table 1: ICT Integration in Higher Education in Bangladesh – Achievements and Challenges Across Key Dimensions

Dimension	Progress / Achievements	Challenges / Limitations
Policy Frameworks and Institutional Initiatives	• National policies emphasized ICT in higher education. • The University Grants Commission implemented several ICT-related projects. • The Bangladesh Research and Education Network (BdREN) enabled high-speed internet, digital libraries, online learning, and research collaboration. • Universities adopted digital systems such as online admission portals, e-libraries, and automated result publication.	• Uneven ICT adoption, with major universities in Dhaka and Chittagong progressing faster than regional and smaller private institutions. • Top-down policy approach without localized adaptation created implementation gaps.
Infrastructural Developments and Gaps	• Internet connectivity expanded in recent years. • Some private universities (mainly in urban centers) provide reliable Wi-Fi, modern classrooms, and computer labs. • BdREN facilitated collaboration and digital access across public universities.	• Internet connections remain slow, unstable, and costly in many institutions. • Rural and semi-urban universities face frequent power outages. • Computer labs and multimedia facilities are inadequate and unevenly distributed. • Significant urban–rural divide persists.
Faculty Readiness and Capacity Building	• Younger faculty are generally more comfortable with ICT. • Some faculty use PowerPoint, LMS, and online platforms in teaching. • Training workshops have provided basic exposure.	• Many senior academics rely on traditional lecture-based pedagogy. • Training is often fragmented and lacks follow-up support. • Limited institutional incentives to innovate teaching. • Career progression prioritizes research output over teaching innovation.
Student Access and Digital Divide	• Urban and affluent students have better access to devices and internet services.	• Rural and disadvantaged students face limited access to devices,

	• Some universities expanded e-resources and online support during COVID-19.	connectivity, and affordability. • Large-scale exclusion occurred during the shift to online learning. • Low levels of digital literacy created psychological resistance among students and teachers. • Female students face cultural restrictions and household-level barriers to ICT use.
Impact of COVID-19 Pandemic	• Accelerated ICT adoption and rapid transition to online learning platforms. • Institutions with prior ICT infrastructure adapted more effectively. • Hybrid and blended learning models introduced and retained post-pandemic.	• Exposed serious infrastructure and access weaknesses. • Deepened existing inequalities among students across socio-economic and geographic lines.
Emerging Innovations and Good Practices	• Some universities developed e-learning platforms with recorded lectures and assessments. • Partnerships with international MOOC providers expanded student access to global content. • Digital libraries and research databases improved access to scholarly resources.	• Innovations remain concentrated in a few institutions. • Benefits are often restricted to specific programs or departments. • Scaling requires long-term reforms and sustained government commitment.

Source: Compiled by the author from secondary literature [17]-[22], [24], [27], [30]-[32], [34], [37], [39], [40]

4. CONCLUSION

The integration of ICT into higher education in Bangladesh is both urgent and challenging. Government initiatives such as the Digital Bangladesh Vision 2021 and the National ICT Policy 2018, along with the growth of BdREN and digital administrative systems, indicate progress; however, infrastructural gaps, limited faculty preparedness, and unequal student access continue to undermine ICT's potential. ICT should not be treated merely as a technical tool but as a catalyst for broader educational transformation, requiring student-centered pedagogy, problem-solving learning, and critical thinking. This transformation depends on sustained investment in teacher training and incentives for pedagogical innovation rather than solely research productivity.

Equity remains a critical concern, as socio-economic and gender disparities restrict access for poor, rural, and female students, a problem highlighted during the COVID-19 pandemic. Policies providing subsidized internet, affordable devices, and support for disadvantaged learners are essential to prevent ICT from creating a two-tiered system. Sustainable investment and management are also necessary, as many initiatives rely on short-term donor funding. Long-term state-supported funding, decentralization of decision-making, and strong accountability mechanisms can enhance responsiveness, innovation, and equitable access.

ICT offers significant opportunities to align higher education with labor market demands and national development goals. Integrating ICT into curricula improves graduates' employability, strengthens Bangladesh's knowledge economy, and leverages the potential of its large youth population. By addressing infrastructure, pedagogy, and equity challenges, ICT can transform higher education into an inclusive, globally competitive system while fostering innovation and national development.

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