Factors Influencing the Usage of Edtech Platforms in Bangladesh

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Abstract

With the introduction of new and improved technologies, the conception and rapid growth of educational technology or Edtech has quickly gained success all over the world. Bangladesh is no different to this trend, as a very lucrative Edtech sector has emerged within the last few years. This recent influx in Edtech platform expansion and usage raises the need for further investigation as to what factors influence the usage of the Edtech platforms in Bangladesh. To address this research gap, this study was conducted among 222 people who were aware of Edtech platforms and their functionality in Bangladesh. The hypothesis testing showed that there was a relationship between Edtech technology and improvement of cloud computing in Bangladesh. Factor analysis was done to identify the most prominent factors, namely 'User Convenience', 'Quality of Learning', 'Instructing Capability', and 'User Capability'. The quantitative analysis results mostly coincided with the qualitative data derived from literature review as well as the expert interviews. Future researches should be carried out to more geographical locations such as rural areas with a wider range of demographic variable like income level and family size to better understand the Edtech usage factors in Bangladesh.

1. Introduction

Edtech, a short form of 'Education Technology' stands for the concept of educational materials and services being delivered to their intended audience through a combination of hardware and software that are designed to enhance the teaching and learning experience (Frankenfield, 2022). Edtech encompasses various technologies like learning theory, online education, and computer-based training, all aimed at enhancing the learning process.

The 4th industrial revolution, marked by IoT, cloud tech, and AI, catalyzed Edtech's growth. This "EdTech" sector revolutionized education, especially during Covid-19 pandemic, providing vital tools like audio/video calls, virtual classrooms, and augmented reality. These innovations transformed education accessibility, emphasizing technology's pivotal role in modern learning.

Bangladesh is no different to the above-mentioned case, as the Edtech sector in the country has transformed into one of the most lucrative industries over the last decade. Early players like Khan Academy and 10-minute school paved the way for newcomers. The Bangladesh government actively promotes Edtech, with over 200 organizations competing in this lucrative yet competitive market. These companies, backed by influential investors, signal confidence in the sector's enduring success. To flourish in the face of mounting competition, Edtech players innovate by introducing new programs, integrating cutting-edge technologies, and elevating service quality, ensuring they remain at the forefront of this dynamic industry.

The rapid growth and commercial interest in the Edtech sector call for deeper research. While there's evident demand for Edtech platforms in Bangladesh, a comprehensive study on the factors making it a viable educational alternative for a large population is imperative. Existing literature on Bangladesh's Edtech future lacks concrete studies on acceptance drivers, leaving a significant gap in understanding the sector's potential. Therefore, the aim of the study is to -

- find out what factors are most important when it comes to using Edtech platforms in Bangladesh
- examine to what extent these factors influence the usage of Edtech platforms
- analyze if there is any relationship between Edtech usage and gender and
- examine the relationship between Edtech usage and improvement of 4IR technology

2. Literature Review

The origins of educational technology (Edtech) can be traced to the early 20th century when educational practices began to integrate technological advancements. The emergence of educational films and projectors in the early 1900s marked the beginning of integrating technology into educational environments as an ancillary resource to traditional pedagogical methods. The delivery of instructional content was facilitated through the utilization of

audio recordings, slide projectors, and filmstrips (Haydn, 2013).

In the fast-developing digital world of today, educational technology has emerged as a powerful instrument that offers enormous potential to revolutionize the traditional methods of teaching and learning. The term "Educational Technology," more usually abbreviated as "Edtech," refers to the application of technological advances, tools, and resources with the intention of enhancing the processes of teaching and learning as well as educational accomplishments. Edtech platform, an abbreviation for Educational Technology platform, refers to a software application or digital platform designed to facilitate and enhance teaching and learning activities (Januszewski & Molenda, 2008). The platforms leverage technological advances to enhance educational experiences, facilitate access to educational resources, and provide instruments for instructional delivery, evaluation, collaboration, and administration.

The goals of Educational Technology (Edtech) platforms include increasing student engagement and motivation, customizing learning experiences to meet the unique requirements of individual students, fostering collaborative and communicative skills, facilitating access to educational resources and opportunities, and improving learning outcomes. By integrating technology into various aspects of the teaching and learning process, Edtech platforms seek to enhance educational accessibility, engagement, and outcomes through blended learning, flipped classrooms, and adaptive learning (Dede & Richards, 2012).

The integration of mainframe computers and computer-assisted instruction (CAI) during the time frame of the 1960s to the 1980s marked a significant shift in the realm of educational technology (Edtech). The early computer programmers, exemplified by PLATO (Programmed Logic for Automatic Teaching Operations), enabled interactive educational experiences and personalized instruction. The era between the 1980s and 1990s witnessed a surge in the prevalence of personal computers and the advent of educational software, which facilitated the extensive integration of computer-based learning (Bishop, Boling, Elen, & Svihla, 2020). The accessibility of software applications, including educational games, tutorials, and simulations, has expanded, rendering them more readily available to both educational institutions and independent learners. The field of educational technology witnessed significant advancements during the 1990s and 2000s, owing to the emergence of the internet and the World Wide Web. The advent of the internet has greatly eased the process of accessing a wide range of educational resources. Additionally, the availability of online learning management systems (LMS) and virtual learning environments (VLE) has made it possible to offer online courses and facilitate distance education (Wikipedia, n.d.).

Virtual learning environments spread with the internet in the late 1990s and early 2000s. Coursera, Udacity, and edX have made Massive Open Online Courses (MOOCs) available online. Adaptive learning platforms have garnered interest since the 21st century. Algorithms and data analytics personalize learning experiences for each student. Adaptive learning platforms customize resources and pathways to improve learning outcomes (Reiser, 2001). Smartphones and tablets have made mobile learning systems popular. These platforms use mobile devices to provide educational content, communication, and mobile learning. Modern educational technology includes Integrated Learning Experience Platforms (ILEPs) as a part of the integrated system.

The concept of educational technology (Edtech) and the development of Edtech companies can be traced back to the early years of the computer era. after the establishment of PLATO (Programmed Logic for Automatic Teaching Operations) 1960s, companies like Computer Curriculum Corporation (CCC), Apple Inc., Learning Company, SMART Technologies, Blackboard Inc., Moodle paved the way for the Edtech industry moving forward to the 21st century (King, 2017). Edtech in America is a leader in innovation and implementation due to technological advancements, supportive policies, and a robust entrepreneurial ecosystem. Edtech has had a significant impact on the education landscape, with increased access to education, blended learning models, personalized learning, gamification and interactive learning, and Learning Management Systems (LMS) in the USA. These technologies have enabled increased access to education, blended learning models, personalized learning, gamification, interactive learning, and learning management systems (Saettler, 2004). With a myriad of platforms built to fulfil a variety of educational requirements, the United States serves as a central center for educational technology innovation. Companies like Coursera, Udemy, and Khan Academy offer online courses and instructional information across a wide range of areas. Learning management systems, such as Blackboard and Instructure, provide comprehensive online environments for the management and administration of educational programs including classes. Adobe provides dedicated creative software tools for educational applications, while ClassDojo emphasizes managing classroom and conducting and improving communication. The interactive presentation and collaboration tools provided by Nearpod are available to educational institutions (Culp, Honey, & Mandinach, 2005).

There have been a number of country specific Edtech platforms that are notable, and in Russia, Skilbox is the Edtech platform with the highest revenue, whereas Stepik, LinguaLeo, and Yandex Praktikum are currently at the forefront of the market. A study has identified that the primary challenges to the adoption of e-learning and Edtech platforms in Russia are inadequate digital infrastructure, insufficient digital literacy skills among educators and learners, and cultural barriers (Bazhenov, 2019). The Edtech industry in China is characterized by

intense competition, as established firms and emerging enterprises compete for a slice of the market. Several notable educational technology firms in China comprise TAL Education Group, New Oriental Education & Technology Group, VIPKid, and Yuanfudao. According to recent market research, the China Edtech market has been assessed at a value of $69.6 billion in 2021, with an anticipated compound annual growth rate (CAGR) of over 25% projected for the period spanning 2021-2026. It is anticipated that the integration of educational technology (Edtech) amid the pandemic will have enduring implications on pedagogical frameworks, affording prospects for expanded remote learning in the times ahead (Globaldata, 2022). In recent years, the Chinese government has actively supported and promoted Edtech initiatives. Policies have been implemented to encourage Edtech innovation, foster public-private partnerships, and enhance digital literacy among educators and students (Alamin, Shaoqing, & Le, 2015).

In regard to other continents, Edtech is transforming the education landscape in Africa, enabling learners to access educational resources and engage in interactive learning experiences. Edtech in Africa has immense potential to bridge educational gaps, empower learners and educators, and create a more inclusive and equitable education system (Tadesse, Allen, & Mitchell-Kernan, 2021). According to a recent study, there is significant potential for distance learning and eLearning in Sub-Saharan Africa through the utilization of Open Educational Resources (OER) and Open Distance and eLearning (ODeL) (Darkwa & Mazibuko, 2000) (Cornelia K. Muganda, 2016).

On the other hand, the utilization of educational technology is transforming the field of education in South Asia by mitigating the educational gap, offering customized learning opportunities that cater to the unique requirements of each student, and enhancing pedagogical approaches. (Dhamija, Sharma, & Dhamija, 2020) The utilization of educational technology (Edtech) holds promise in enhancing the quality of education and enabling the upcoming cohort in South Asia through the reduction of educational disparities, fostering individualized learning, and empowering instructors (Khan S. , 2022).

In terms of growth and availability, Edtech in India has the ability to completely transform the educational system, increase students' access to high-quality learning opportunities, and foster the development of a highly skilled labor force by harnessing technological advancements and unconventional teaching methods through initiatives like Digital India, National Digital Literacy Mission, and Atal Innovation Mission (Yadav, Gupta, & Khetrapal, 2018). India's Edtech sector has seen significant growth, with companies such as BYJU's, Unacademy, Vedantu, and Toppr emerging as leaders. Edtech leaders in India include Toppr, UpGrad, Great Learning, and Cuemath, contributing to the growth and development of the Edtech ecosystem. A study conducted in India has investigated the sensemaking process of teachers, with a focus on exploring the diversity of teacher experiences and the strategies they employ to successfully integrate educational technology (Edtech) in accordance with their individual contexts and the needs of their students (Miglani & Burch, 2019).

In several other south Asian regions, the rise of the Edtech industry can be attributed to the increased accessibility of digital technologies and the recognition of technology's significant impact on the field of education. The domain of educational technology in Nepal is experiencing growth; nevertheless, certain impediments must be overcome, such as limited availability of internet connectivity and linguistic diversity (Devkota, 2019). Similarly, the incorporation of Edtech has significantly contributed to the improvement of teacher education standards in Pakistan. The accomplishments have been realized by means of offering diverse resources, providing avenues for enhancing one's professional skills, promoting teamwork, and establishing connections, utilizing a combination of traditional and online learning methods, implementing digital teaching strategies, and adopting efficient evaluation and response methods (Abbasi & Millar, 1996).

In the last couple of years, with the advent of technological revolution, the Edtech platforms in Bangladesh has received significant propulsion and incentive to become an integral part of the conventional education system. Although the Edtech sector is comparatively new, it has gained noteworthy attention and has shown the potential to transform the industry in an innovative way. Besides bringing unprecedented solutions in the educational sector, Edtech has caused a burgeon in entrepreneurship and employment (Shams, 2023). The obstacles in the educational sector of Bangladesh will hopefully be resolved by the emergence of technology in this field. Nevertheless, the beneficiaries from this perquisite, being comparatively new with the use of technology in education, will face unparallel challenges. To make the use of technology elementary, there has to be an abundance of research and investment in this field. (Khan, Hasan, & Clement, 2012)

The educational institutes of Bangladesh have comprehended the necessity of digital platforms for education and distance learning, and a number of the academic institutes have decided to develop such contents and platforms accordingly. The formation of interactive and user-friendly academic portals is a necessary project to be undertaken based on the feedback of students and teachers who already have access to the digital platforms of education. Evidently, the government of Bangladesh has urged the educational institutes to accommodate 'Integrated University Information Management Platform' in the respective academic fields (Chowdhury, 2020). The ramifications of 4IR in the technological field includes several elements like education technology, IOT, cloud computing, AI, blockchain, etc., all of which have an inevitable effect on education. Per study, there will

be a widespread use of blockchain features, cyber security, and computing in educational activities. For a successful implementation of all these modes, there needs to be an integration between the users of these technological tools (Elayyan, 2021).

The possibilities of 4IR have brought about a revolution in the learning and thought process associated with education and technology. This has caused the traditional tools of education to lag behind in accordance with the parallel advancing technology. It is therefore necessary to update the classroom facilities and educational tools so that the pertinent people remain acquainted with the upcoming challenges related to education. These measures include the latest versions of digital machinery, seamless internet, as well as expert people to aptly use the computing devices (Kayembe & Nel, 2019).

3. Methodology

The study employed a pragmatic mixed-method approach, combining both qualitative and quantitative research methods. In terms of theory development, a deductive approach is utilized, where initial hypotheses, based on existing theories or prior information, guide the research. These hypotheses are tested and proven or disproved by the study's data. This deductive method not only confirms previously held hypotheses but also generates new ones via careful consideration of a wide variety of factual facts. Patterns, relationships, and statistical significance in the quantitative data were discovered utilizing advanced statistical methods using SPSS 26. Data was collected through a survey using convenience sampling. The study is cross-sectional, conducted within a limited timeframe, recognizing the potential for evolving consumer preferences.

3.1 Qualitative data collection

As the education technology sector is comparatively new in Bangladesh, interviewing the associated people in this field deemed a logical approach for the initial understanding of the Edtech startup ecosystem in Bangladesh. Additionally, the interviewees from Edtech platforms were selected based on expertise, management experience, technological knowledge, prior experience in the education sector, and achievements in establishing their platform names as a brand. To gain versatility in gathering information, the chosen interviewees were from different roles and expertise in the relevant field.

To form the basic outline of the research, a qualitative approach was taken, and the selected professionals were reached out and interviewed in a semi-structured format. After reaching out to the interviewees via personal contact, official procedure, references and emails, the interviews were conducted through online meetings, in-person meetups, and emails. The semi-structured interviews assisted in understanding the issues in an elaborate manner as the subsequent enquiries of the interview could be based on the preceding information obtained from the interviewees. The information obtained from the interviews were gathered and analyzed to comprehend an insight on the in-depth culture of the Edtech startup ecosystem. Based on the qualitative data collected from the executives in this area, a questionnaire was structured, covering the necessary variables for streamlining the research.

Based on the data collected from the interviews, it was conclusive that further data collected from a sample of the target population would potentially enable opportunities to not only analyze the factors influencing the utilization of Edtech platforms, but also additional relationships that play a key role in people adapting to Edtech such as gender, cloud computing, etc.

3.2 Quantitative data collection

In this phase of the study, a questionnaire was developed based on insights obtained from interviews. Primary data was collected from 222 respondents who were familiar with educational technology platforms used for institutional studies and skill development. The respondent group primarily consisted of individuals aged 15 to 30, including students and professionals. Among these 222 respondents, over 72% were male, and approximately 27% were female. Notably, 27% of the respondents had no prior experience with educational technology platforms.

The questionnaire included demographic variables, such as gender, education level, usage frequency, and location, to ensure the data's traceability and precision. The questionnaire was designed to explore the central objective of the research, focusing on key constructs related to the ease of use, accessibility, teaching quality, and assessment quality offered by online educational technology platforms. These concepts were presented to the respondents as inquiries, to which they responded on a 5-point Likert scale, indicating their level of agreement with the ideas concerning educational technology platforms.

This segment of the study involves the analysis of the primary data gathered through the questionnaire, employing various statistical methods. For descriptive statistics and factor analysis, data only from respondents who had prior experience with Edtech platforms were utilized, as they possessed a better understanding of these factors. However, for hypothesis testing, data from all respondents was considered, as the study aimed to identify reasons behind not using Edtech platforms.

All responses were collected via Google Forms. Data cleaning and preparation were carried out using Microsoft Excel, while statistical calculations were performed using SPSS 26. The outputs from SPSS 26 were slightly modified to enhance data representation and comprehension.

4. Results and Analysis

This section discusses the results and analysis of the study.

4.1 Qualitative Analysis

The majority of the qualitative data collected for the purpose of this study originated from interviews. The interviewees included professionals who were involved with various Edtech platforms or companies of Bangladesh at various levels, including founder, instructor, executive, etc. The interviewees unanimously agreed with the claim that the Edtech sector of Bangladesh have experienced an enormous surge and will continue to do so for years to come. The interview participants also agreed that in order for the sector to fully reach its potential, a large number of external factors need to be addressed as well.

In order to determine exactly what factors Edtech platform users consider and prioritize, questions were asked to the interviewees regarding which areas of their platform experienced the most engagements, which areas received the most criticisms, which areas required the most innovation, etc. The knowledge of consumer preferences and feedback learnt from these interviews were utilized to come up with the variables that would be used for further quantitative analysis. Once these variables were identified, they were then transformed into suitable questions. Quantitative data collected on these variables were analyzed using factor analysis.

One of the key takeaways from the interviews had to with the existing stigma regarding Edtech education that currently prevails in Bangladesh. It is commonly believed in Bangladesh that use of new and improved technology requires sophisticated knowledge of hardware and other technological tools, however in reality that is not the case. In order to test this assumption further, hypothesis testing was conducted using variable data regarding Edtech usage and use of technology and hardware. Similarly, it is also commonly believed that an adequate internet connection is an absolute necessity when pursuing Edtech education. To test whether the participants of the survey agreed with the belief, a hypothesis test was also done using variable data of Edtech usage and internet access.

In addition to identifying variables, there were a few other aspects that raised interest in terms of potential research as well. One topic that came up frequently in the interviews is whether gender would play more or less of a role in pursuing education in Bangladesh going into the future. Traditional institutional education in Bangladesh has historically seen lesser participation of females compared to males due to financial barriers as well as social customs. With Edtech enabling pursuit of quality education from the comfort of home, there is a significant possibility that women may become more likely to pursue Edtech education. This topic was explored further in the quantitative analysis section of this research through hypothesis testing.

Another important factor to consider is that from the Interviews, interviewees mentioned that many of the courses they offer, especially courses that were for K-12 students were free of cost. Even skill development courses were cheap, as many people buy these courses and even at a cheap price, they can reach the break-even point for that course quite comfortably. For that reason, the interviewees believe that income of the users of Edtech is not an important factor. So, despite this factor seemingly very important, no related hypothesis was tested for this study.

Finally, there was also a significant discussion regarding how new and improved technology introduced as part of the 4th Industrial Revolution have impacted the Edtech industry. As per the interviewees, one of the key ingredients behind the success of the Edtech platform has been the ability of users to access educational content from anywhere. This has been enabled by the utilization of cloud technology, one of the key components of 4IR. In order to quantitatively test this theory, hypothesis testing was performed using the locational accessibility variable. The following table summarizes the factors that influence Edtech usage.

Table 1: Derived Factors that influence Edtech Usage

Sl.	Factors Influencing the Edtech Industry of Bangladesh
1.	Ease of Use
2.	Comfortable Environment
3.	Helpfulness of Digital Resources
4.	Content Format
5.	Quality of Assignment
6.	Locational Accessibility
7.	Helpfulness of Feedback
8.	Test taking in Comfortable Environment
9.	Quality of Evaluation
10.	Content Available to Instructors
11.	Knowledge of Instructors
12.	Instructor Interaction
13.	Hardware Available to Instructors
14.	Quality of Course Material
15.	Helpfulness of Assignments
16.	Learning from Exams
17.	Quality of Testing
18.	Quality of Feedback

4.2 Quantitative Analysis

Before going into further analysis, the validity and reliability of the study needs to be looked at, as it would provide an insight into the quality and accuracy of the findings derived through the questionnaire. The reliability of the questionnaire was calculated at 0.862. This is an ideal score, as it shows that the reliability and validity of the study was above ideal standards.

Table 2: Reliability Statistics of the data

Reliability Statistics	
Cronbach's Alpha	N of Items
0.862	19

Descriptive Statistics

To begin with, the descriptive statistics section of this study's analysis the output for each of the 19 questions asked in the questionnaire. From the descriptive statistics table (see Appendix B), it can be concluded that:

Strength of Responses: The factors regarding quality of course materials, proper access to hardware, internet access, accessibility from anywhere, content accessible to instructors and user friendliness generated the strongest positive response from the participants as seen from the mean statistic. However, factors such as knowledge of hardware, attending exams online and contribution of exams to learning showed the most neutral to negative responses. It should be mentioned that all the factors generated positive feedback, as the mean statistic for every factor was above a 3.

This positive relationship can also be observed from the skewness statistic, as the value generated for each and every factor was negative.

Diversity of Responses: In terms of diversity of responses, participants had the least homogenous responses regarding the knowledge of hardware, attending exams online, instructor interaction and hardware available to instructor factors. This can be seen from the standard deviation statistic in the table. On the other hand, the responses of participants regarding the factors of user friendliness, quality of course material, internet access and access to hardware were the most homogenous of all the factors presented in the questionnaire.

Nature of Distribution: The Kurtosis statistic provides an insight as to the nature of distribution for all the data points associated with the factors. To begin with, the factors of internet access, knowledge of instructors, content available to instructors and cost of Edtech had the highest kurtosis statistic, meaning that the distribution

of these factors had the least number of outliers. On the other end of the spectrum, the factors with the most negative kurtosis scores were knowledge of technology and hardware and attending exams online, indicating that these factors generated had the distribution with the largest number of outliers.

Hypothesis testing
The Hypothesis testing was done using the Crosstabs function of SPSS.

Table 3: Summary of Hypothesis

Sl.	Hypothesis	Pearson Chi-Square Asymptotic Significance (2 sided)	Result
1	H_0: There is no relationship between the use of Edtech platforms and gender in Bangladesh	0.229	Can't Reject Null Hypothesis
2	H_0: There is no relationship between the use of Edtech platforms and Improvement of cloud computing in Bangladesh.	0.019	Reject Null Hypothesis
3	H_0: There is no relationship between the use of Edtech platforms and having good knowledge of technology and hardware	0.242	Can't Reject Null Hypothesis
4	H_0: There is no relationship between the use of Edtech platforms and having access to good Internet	0.671	Can't Reject Null Hypothesis

So, in general, the Edtech platforms seem to be free from some common notions that many people in Bangladesh think according to the tests of the hypothesis.

Factor Analysis
To find out whether the collected data is appropriate for conducting factor analysis, the following KMO and Bartlett's test was performed. SPSS calculated the value of the statistic at 0.869, which is much higher than the acceptable threshold of 0.5. Therefore, the study proceeded further into the factor analysis.

Table 4: SPSS 26 output of KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.869
Bartlett's Test of Sphericity	Approx. Chi-Square	1106.683
	df	171
	Sig.	0.000

The correlation Matrix (see Appendix C) was analyzed to gain insight about the relationships between variables. From the correlation matrix, the following interpretations can be made:

- There were no negative correlations between any of the factors in question, indicating that all the factors are positively correlated to each other.
- The following factors showed strong positive correlation with each other:
  - **Ease of use** with helpfulness of digital resources, content format, and comfortable environment.
  - **Helpfulness of digital resources** with comfortable environment, content format, locational accessibility, user friendliness, learning from exams and helpfulness of feedback.
  - **Internet access** with hardware access and availability as well as cost.
  - **Locational accessibility** with user friendliness and quality of course material.
  - **Knowledge of instructors** with quality of course material and content available to instructors.
  - **Quality of course material** with content available to instructors.
  - **Learning from exams** with helpfulness of assignments and exam performance.
  - **Helpfulness of assignments** with helpfulness of feedback.

From the total variance table (see Appendix A), it was observed that the number of components is equal to the number of factors. However, it will not be necessary to use every component for the factor analysis. It can be observed that the eigenvalues are greater than 1 for the first 4 components, thus 4 components will be used for analysis moving forward. Looking at the cumulative variance, it was observed that these 4 components account for 57.67% of the total variance.
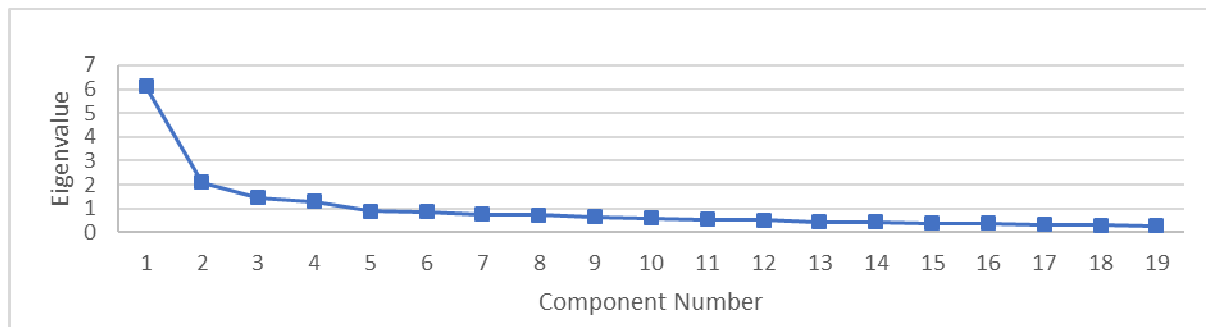
Figure 1: Scree Plot of the data

The scree plot for these set of factors shows the comparison of eigenvalues with respect to the number of factors. We can observe that once the curve reaches 4 factors, its downward slope decreases by smaller and smaller margins. This indicates that past the first 4 factors, each additional factor accounts for a lesser and lesser proportion of the total variance. Therefore, 4 total factors will be used for the factor analysis.

From the component matrix table(see Appendix E), it is apparent that most of the factors with the highest coefficients fall within the first component. This is not appropriate for the purpose of this study, as the correlations within all of the components were not significant enough.

So, a rotated component matrix was used. In the rotated component matrix, it can be observed that component 1 has six factors, component 2 has four factors, component 3 has five factors and component 4 has four factors, which are highlighted in the table shown below. Also, it can be seen that the Pearson Coefficients have a higher value comparatively in the rotated component matrix. For example, in the component matrix, the Good Technological & Hardware Knowledge have a low coefficient of 0.357. But in the rotated component matrix, this factor increased to 0.524, which is a significant increase.

So, based on the rotated component matrix, the 19 factors were grouped into four broad categories. They are:

User Convenience: of Ease of Use, Comfortable Environments, Helpfulness of Digital Resources, Content Format, User Friendliness and lastly locational accessibility.

Quality of learning: Helpfulness of Assignments, Learning from Exams, Helpfulness of Feedback, and Test Taking in a Comfortable Environment.

Instructing Capability: Content Available to Instructors, Knowledge of the Instructors, Instructor Interaction, Hardware Availability to Instructors, and Quality of Course Materials.

User Capability: Hardware access and availability, Internet Access, Cost and Knowledge of tech and hardware.

Here, as shown in the Table 5 below, the first six factors from the Rotated Component Matrix were merged into a single factor named User Convenience. This factor is comprised of Ease of Use, Comfortable Environments, Helpfulness of Digital Resources, Content Format, User Friendliness and lastly locational accessibility.

After the first six factors, the next four factors grouped by the rotated component matrix were merged into a factor named Quality of Learning. These four factors are Helpfulness of Assignments, Learning from Exams, Helpfulness of Feedback, and lastly Test Taking in a Comfortable Environment, as all four of these factors are related to evaluation and feedback process, which is a big part of learning quality.

The next five factors grouped by the rotated component matrix are Content Available to Instructors, Knowledge of the Instructors, Instructor Interaction, Hardware Availability to Instructors, and Quality of Course Materials. All these factors were combined to form a factor named Instructing Capability.

Table 5: Rotated Component Matrix (suppressing residuals <0.4)

Rotated Component Matrix[a]				
	Component			
	1	2	3	4
Ease of use	0.770			
Comfortable Environment	0.753			
Helpfulness of Digital Resources	0.739			
Content format	0.690			
User friendliness	0.460			
Locational accessibility	0.415			
Helpfulness of Assignments		0.756		
Learning from Exams		0.748		
Helpfulness of Feedback		0.620		
Exam performance from comfortable environment		0.601		
Content available to instructors			0.728	
Knowledge of Instructors			0.688	
Instructor interaction			0.680	
Hardware available to instructors			0.645	
Quality of Course Material			0.519	
Hardware access and availability				0.738
Internet access				0.713
Cost				0.695
Good Technological & Hardware Knowledge		0.464		0.524
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 8 iterations.				

Lastly, the last four factors named Hardware access and availability, Internet Access, Cost and Knowledge of tech and hardware were merged into a factor named user capability, as all of these are dependent on the user. As discussed from the findings of the hypothesis, these technological limitations were found to be a non-issue behind the usage of Edtech platforms.

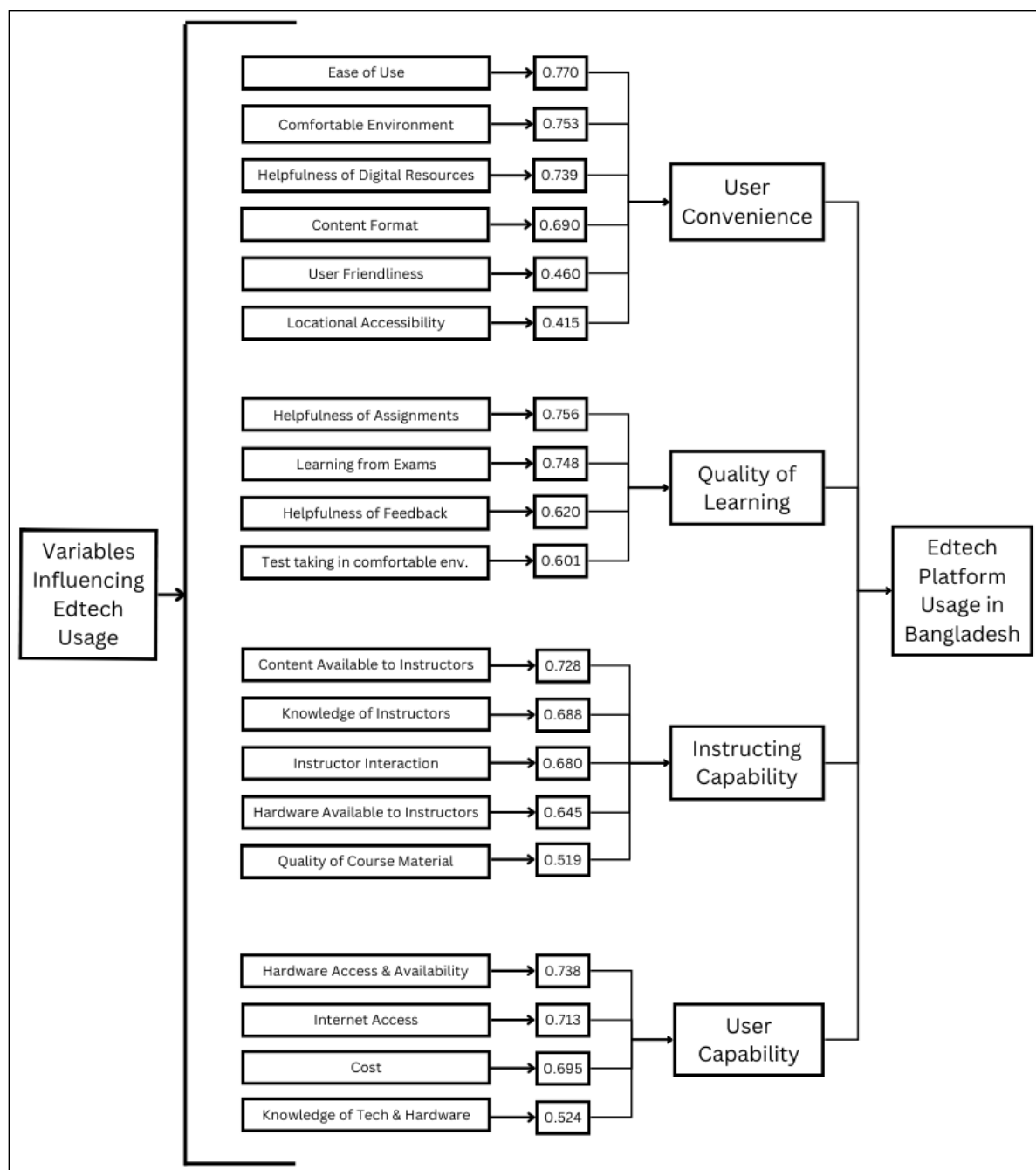The conclusive framework of the study is shown in the figure below.

Figure 2: Conclusive Framework Using Factor Analysis

5. Discussion

The Edtech sector of Bangladesh has experienced a significant surge and will continue to do so for years to come. To reach its full potential, several external factors need to be addressed. These were identified through qualitative analysis and validated and reduced to four factors by quantitative analysis. Apart from the primary objective, many interesting things were observed, in both the qualitative and quantitative analysis.

The study identified various factors that influence Edtech platform usage in Bangladesh through depth interviews with different Edtech platforms. These factors include ease of use, comfortable environment, helpfulness of digital resources, content format, quality of assignments, locational accessibility, helpfulness of feedback, test-taking in a comfortable environment, quality of evaluation, content available to instructors, knowledge of instructors, instructor interaction, hardware available to instructors, quality of course material, helpfulness of assignments, learning from exams, quality of testing, and quality of feedback.

The interviews revealed a prevailing stigma in Bangladesh that using new technology and hardware

requires sophisticated knowledge, and the assumption that an adequate internet connection is essential for Edtech education. The possibility of women pursuing Edtech education was explored due to the potential of online learning to overcome financial barriers and social customs. Many of the courses, including K-12 and skill development courses, were found to be free or affordable, with the interviewees noting that income was not a significant factor for Edtech users. So, some of this information was used to create some hypothesis which was later tested in the qualitative analysis.

As Gender is a major barrier for regular Institutional Education in Bangladesh, this hypothesis was tested first. From this study, it was seen that gender is not a key factor in using Edtech in Bangladesh, so it was concluded that people use it regardless of their gender.

Secondly, there are many common notions like requiring a better device (latest phone or laptop), a better internet connection (4G/LTE equivalent connection) etc. to use Edtech. Although this may be true to some extent, and these may help someone to access them quite easily, for most of the cases, these are not that important. There are many people, as seen from the survey, who use Edtech from outside of Dhaka, even in rural areas. It was also learned from the in-depth interviews from the industry leaders that many of their platforms' students are from rural areas, where the availability of good internet is limited in many cases. Therefore, all these factors together confirm the fact that to use Edtech, having a fast internet connection is not mandatory.

However, a mandatory element, which is a key driving force behind the boom of Edtech in Bangladesh, is improvement of cloud computing and integrating various 4IR technologies in the Edtech industry. From the survey, it is quite evident that the main reason people use Edtech is because of convenience. People really prefer the fact that they can use Edtech platforms from any location. Especially in the case of Bangladesh, where going outside is a hassle currently due to excessive traffic congestion and precarious weather conditions, being able to learn while staying at home, or even at offices is extremely important for many people. As a result, Edtech companies are investing heavily in technologies that enable the users to learn easily in their preferred location. Most of the platforms have easy to use websites and mobile applications, which makes the user experience notably pleasant.

At the start of the research, many factors relevant to Edtech were identified from in-depth interviews with industry experts. With factor analysis, new categories were selected to build an updated research framework with four broad factors. It can be seen that from all these four factors, one is "User Convenience", which is term used a lot since the start of this research. User convenience consists of Ease of Use, Comfortable Environments, Helpfulness of Digital Resources, Content Format, User Friendliness, and lastly locational accessibility.

Apart from User Convenience, Quality of Learning, Instructor Capability and User capability were found to be the other contributing factors for Edtech usage. It is notable that from the Qualitative analysis, as well as from Hypothesis testing, the sub factors of User Capability, namely Hardware access and availability, Internet Access, Cost and Knowledge of tech and hardware were all found to be the least important factor for Edtech usage, so it is not surprising that these factors were grouped together by the factor analysis. Also, it also means that the improvement of 4IR is not that much relevant yet from a user's perspective.

For the next factor, Helpfulness of Assignments, Learning from Exams, Helpfulness of Feedback, and Test Taking in a Comfortable Environment were grouped together to a single factor named "Quality of learning. The last grouped factor is "Instructing Capability", which is comprised of Content Available to Instructors, Knowledge of the Instructors, Instructor Interaction, Hardware Availability to Instructors, and Quality of Course Materials.

As a whole, it can be said that these four factors, namely User Convenience, Quality of learning, Instructing Capability and User Capability are the main reason why people use Edtech. To find out which factor is the most important, further analysis is required.

6. Conclusion

The results from the comprehensive qualitative and quantitative analysis indicate that all the identified factors positively affect Edtech platform usage to varying degrees. The conclusive results from the factor analysis were congruent with what was discussed during the expert interviews as well as the literature review carried out for this study, as each of the variables were generally favored by the participants. This, combined with the high reliability of the collected data can serve as an argument for this study to be a valid and comprehensive research. The insight gained from this data shows possible opportunities for Edtech platforms of Bangladesh to further improve their services and garner a larger audience. The four categorized factors derived from factor analysis, namely User Convenience, Quality of Learning, Instructing Capability and a User capability, can act as a guideline for Edtech platforms to better understand their target demography as well as create better value proposition.

Throughout the research, many things stood out that could use some improvement which would make the adoption of Edtech even more successful. The following are some recommendations based on the knowledge obtained from the study:

- The Edtech platforms must be tailored to be as convenient and user friendly as possible, even if it entails compromising some of the more sophisticated components.
- In order to address the need for better accessibility, the platforms should research ways to optimize educational content so that it can be delivered to users and areas where hardware and internet access is limited.
- Additional focus should be implemented towards improving the quality of instruction through improvement of software & hardware as well as training of instructors.
- As a certain degree of tech literacy is required to adopt to Edtech platforms, educational programs and initiatives need to be undertaken to improve mass tech literacy.
- The four categories can be utilized to better design and strategize the marketing and promotion of the Edtech services to capture a particular intended segment of the market.

Further research about the scope of the study must be broadened to more geographical areas as well as demographics. For example, it can be argued that the users of Edtech platform based in rural areas may be influenced by the variables to a different degree. As a very small proportion of the participants of this study represented rural areas where the potential for Edtech to expand to is high, this study can act as a guideline to conduct similar research in the rural areas of Bangladesh. Moreover, additional demographic data such as income levels and family sizes should be collected to enable further investigation of additional factors that can influence Edtech usage.

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