Explaining the adoption of technology-based design of higher education during and after COVID 19 period from a developing country perspective

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Abstract. COVID 19 has a severe impact in every sphere of life, and education is not an exception to this. Hence, the education sector in developing countries like Bangladesh needs a quick transformation from traditional to technology-based distance learning. The factors influencing online education adoption are explained in this research with a Structural Equation Model (SEM). A survey of 405 students from the universities across Bangladesh revealed that faculty readiness, student readiness, and economic solvency positively impact the students' intention to adopt a technology-based design of higher education. Simultaneously, the online assessment system is a challenge for the students having a negative effect on their intention to adopt technology-based learning. Again, students' intention to adopt technology is substantial in explaining the adoption of online classes by them. The study suggests combining the classroom model with the e-learning model to create a cohesive learning system in the long run. Thus, the model proposed in this research has a crucial implication, which recommends the policymakers to consider it to design a new form of technology-based education in Bangladesh.

Keywords: Bangladesh, COVID 19**,** Distance learning, Higher education, SEM, Technology.

1 Introduction

The proliferation of COVID-19 has impacted all segments of society, especially education. Countries worldwide have already introduced local and international travel restrictions to protect residents from the deadly disease called COVID 19 and prevent the virus's spread, causing it. Several steps are being taken, including physical distancing, self-isolation or quarantine, and encouraging residents to live at home [1]. The World Health Organization (WHO) announced COVID 19 as a pandemic [2]. Consequently, the educational institutions are declared closed, and the affected countries' governments restricted all the physical meetings and conferences

immediately. The world has witnessed a new normal. The global economy has been badly affected; social distancing has become mandatory and going to school, college, and university are constrained.

Online education, conference, seminar, and e-commerce are the new trends during this pandemic [3]. As most countries have declared the closure of educational institutions nation-wide, it is disrupting the education progress of around 900 million learners [4]. With no exception, the Bangladesh government has declared all educational institutions' closure on March 16, 2020 [5]. The rapid spread of this disease severely disrupted the traditional education approach we were following for decades, and many questions have been raised about the conventional higher education system by the experts. Universities in Bangladesh are trying to switch to the technology-based design of online education amid COVID 19. However, it has become a difficult task for many of such universities to shift online as nobody knew the possible period of the closures when declaring the official shut down of universities [6]. Internship programs and exchange programs have also been postponed by different institutions [7]**.** Thus, there is a high possibility of a colossal session jam if the education is not shifted online within the shortest possible time [5]. Consequently, Bangladesh's education sector is lining a new norm of the technology-based system to meet this challenge. It can be considered as a revolutionary change towards the digitalization of education.

In Bangladesh, both public and private universities are testing different solutions to cope with the situation. Many institutions have started taking online classes through 'Zoom,' 'Hangout meet,' and other platforms. Real-time online instructions, sharing materials using emails, and learning management software applications have become a new trend [8]. There are forty-six (46) public universities and ninety-eight (98) private universities in Bangladesh [53][54], among which seven (07) public universities and sixty-three (63) private universities have already started online classes fully or partially [5]. Still, all instructors are not trained enough for online teaching. Similarly, a large portion of the students is not capable of adapting to this system of education. Many Bangladeshi students do not possess laptops, computers, or even smartphones to attend classes. The underdeveloped universities' infrastructure is not ready yet to adopt technology-based learning management, as well [9]. Due to the higher expenditure and decline in income amid COVID 19, many students might drop their education [8]. The assessment system is also in a dilemma. Students were assessed previously by tests, quizzes, assignments, board exams, and case solving, which are not possible to follow in the same way right now. For evaluating students, two new assessment methods have arisen; one is Team Readiness Assurance Test (tRAT), and the other is Individual Readiness Assurance (iRAT). Students in different countries are being provided the necessary materials to complete assignments within the deadline, tested by instant quizzes right after the submission of individual works or group projects, and are being provided with feedback by the faculties instantly. Though some universities in Bangladesh are trying to keep pace with this new learning trend, its full adoption is still a far-reaching phenomenon.

It is still not too late to take the initiative for full-fledged adoption of technology-based online education in meeting the challenges of the COVID 19 crisis. Though the developed countries like Canada, China, Japan, and the USA had advanced much with the concept of "learning anywhere, anytime" with 5G Technology, developing

countries like Bangladesh are struggling to ensure technology infrastructure and train the instructors to cope with the technology-oriented education.

The earlier research on distance learning mainly discussed various programs, challenges, and suggestions for implementing online education in Bangladesh to ensure successful and high-quality teaching and learning. Nonetheless, most of these studies are conducted with small sample size and scope. Some studies were also undertaken to highlight available techniques and methods to define and evaluate online learning's ground realities. Thus, there is a gap to fill in studying the impact of various factors influencing the students' intention to accept and adopt online classes with particular regard to the COVID 19 scenario. Under the above circumstances, this study discusses the present context of higher education and operating distant technology-based learning opportunities. It also measures the impact of faculty and students' readiness, online assessment system, and economic solvency towards the students' intention to adopt technology for higher education and its actual adoption. This study's findings will be beneficial for the stakeholders of the education sector of Bangladesh, including universities, educators, learners, parents, policymakers, and the government in dealing with this pandemic for ensuring smooth progress of higher education. It will also help the other developing countries struggling with their education management during the epidemic and afterward.

2 Literature Review, Conceptual Framework, and Hypotheses

2.1 Literature Review

Change is hardly accepted and adapted unless there is a bare necessity [10]. The COVID 19 pandemic, with massive disruption in the education sector, has created a new norm in the education system worldwide that forced the nations to embrace technology. New solutions are coming up from the educators and government to support learning continuity during the pandemic. Distance education or online learning is seen to be evolved quickly in recent times [8]. Unlike traditional learning, online education uses technology to facilitate teaching and learning without time and geography [11]. The educational institutions ensure learning through television, Google classroom, and other online platforms in many countries nowadays [7]. This education design is a highly successful complementary tool for mature and self-disciplined responsible learners [12].

Online classes are eminent in higher education, although this aptitude has been exacerbated due to the COVID 19 pandemic [13] [14]. Many facets of the community have been transmitted by the surge of coronavirus contagion making traditional education impossible to carry on [55]. Online learning has been adopted as a prompt reaction for a severe impact of the pandemic on learning worldwide [56]. On the other side, COVID 19 has offered additional opportunities for the world, particularly for the technologically disadvantaged nations, to alter teaching and learning methods and turn its concentration to innovations. Thus, the universities must utilize these opportunities to improve their higher education approaches based on reality [57], and

the educators and learners are required to be prepared both mentally and technologically [58].

Many of the teachers cannot take online classes, and some others are hesitant to take classes virtually. Still, making them prepared for teaching online is not impossible. Preparedness for online instruction includes the psychological and physical (technological) ability of faculty members to create and implement online technology-based learning [58][59]. Earlier studies have shown that learning remotely over the web often demands a considerable amount of time, typically set aside from the dedicated effort for researches and studies[60][61]. As a result, senior faculties are found to weigh the virtual classes less significant than junior educators' thoughts for its pith [21]. Consequently, faculty readiness to re-arrange their time and activities may assume to be a substantial part in the accomplishment of virtual learning success.

Student readiness (SR) is an essential determinant of technology-aided learning [62]. There are three components of SR called Students' Psychological Readiness (SPR), Students' Technological Readiness (STR), and Students' Skills for Collaborative Learning (SSCL) [62]. SPR focuses on the students' thoughts as it affects technology-based learning activities [63]. SSCL shows learner's inter and intrapersonal characteristics [64] [65]. To decide the conceptual issue and create a sound relationship between learners' groups, the theoretical spectrum of skillsets is crucial [66] [67]. For learners, exploring their instructive encounters employing the ideas of distinctiveness and self-control are considered as the vital elements of conceptual skillsets [68]. STR refers to a learner's ability to use improved technologies and innovations regarding technology-based learning [69]. STR is a mix of ideal and troublesome perspectives connected to technologies that are accepted to vary from one another [70].

Ideally, online learning is now an inevitable reality [71]. The move to virtual teaching has reached the stage where the faculty must adopt it. It is asserted that technology-based education, in particular new learning skills and training infrastructures for teachers, has become an essential phenomenon in adapting online education during the interruption in conventional teaching and learning due to COVID 19 [72]. On the contrary, learners must get ready to evoke them. Thinking about the essential elements of web-based learning amid COVID 19, it is fundamental to evaluate faculty and learners' preparedness to accept the new teaching and learning pattern.

Getting all the students connected to the internet is one of the substantial barriers [9]. Though internet connectivity is a vital requirement for continuing education online, many people worldwide are not capable of having it. According to a statistical report of the World Bank, only 30% of South Asians had the privilege of accessing the internet in 2018 [7]. A broader and more profound impact of the Covid-19 outbreak on the educational system may result from the economic crises due to the pandemic control measures. As the situation extends, a three-month lockout after March 25 and therefore a 25% decrease in yearly income per unit, SANEM estimates it as many as 43.90% of the students' families may fall underneath the poverty level [15]. The statistics of the internet accessibility, provided by A4AI (Alliance for Affordability of the internet), indicates the countries' affordability factor in their affordability report by pinpointing the high cost of the internet as a cause of excluding 50% of the world from availing of internet. Even in those countries where the internet

is available, millions of families cannot afford it or cannot access internet connectivity and technological devices. As a result, their children remain deprived of online education [7].

The online assessment method is a matter of concern both for the students and the faculty members. Students were previously tested by assignments, quizzes, tasks, board examinations, and case solving during traditional or face-to-face learning. The evaluations and assessments of learners have been a significant problem under numerous facets of online learning. Thus, the transition from conventional on-campus to distance learning has a negative impact on students' evaluation, which necessitates continuous evaluation to be a part of the digital curriculum [73].

Even though the transformation to online education due to COVID-19 was sudden and immediate, it took place in a broader technology change phase in educational platforms [74][75]. Digitalization in education has gained popularity even before the pandemic though it has become unavoidable in recent time [72]. However, technological equipment's very presence does not necessarily influence the acceptance of online teaching [76]. While technology needs to be integrated into the learning system, the advancement of the infrastructure should be encouraged and supported for ensuring the use of innovative technologies. Web-based education will remain incomplete if the learners are not able to use technology resources. If instructors and learners do not have successful training to use technology-oriented tools for education, the benefit of online teaching will remain to be untapped. Progressively, the university education system should be integrated with innovations and technologies. Opportunities to use high-tech tools and online activities for dynamic and imaginative problem solving should be provided for better distance learning [77][78]. Studies on virtual education suggest that information technologies can allow new educational opportunities [79], and digitalization has become too prevalent in the field of education in recent decades. Despite its possible impact on teaching and learning, technology's mere existence does not necessarily lead to the improvement in education for faculties and students [76]. The technological development to enforce online education, student and faculty readiness for using those technology tools for virtual teaching and learning is a must for its success [72]. The use of specific interactive technology-based platforms for successful online learning is referred to as the adoption of technology for education.

The government of Bangladesh needs to consider combining classroom modes with e-learning modes to create a cohesive learning system in the long term considering the demand for technology-based education. The biggest challenge will be to incorporate e-learning seamlessly into Bangladesh's national education system. The government and higher education institutions need to strategize the immediate effect and possibly creative solutions [8] to continue learning. Bangladesh should not consider over-ambitious proposals to implement a program overnight at educational institutions, nor should it skim over the problem of avoiding the technology-mediated and time-tested process of virtual learning. Bringing all of the students from public and private educational institutions to the technology-based learning platform is a vital challenge [9]. In understanding the possible way of dealing with this challenge, it is essential to examine the factors influencing the adoption of technology-based design of higher education.

Faculty Training and Readiness for Assessment and Teaching Online. Technology has drawn up the revolution in the higher education system, and because of the current crisis, it is generally embraced by all more or less [10]. Though Bangladesh Open University (BOU) developed an ICT-supported immersive learning experience in 2010 using film, cell phones, LMS-based SMS platforms, and creative pedagogy [16], many faculties opposed the move to online learning then. Unfortunately, the institutions' authorities have not offered the required training to the instructors so that they would be able to manage online classes and assessments efficiently. This lack of training opportunities might trigger reluctance from some of the faculties.

Regarding the relationship between instructors and students, most students indicated that their desires did not match as they expected more positive, communicative, and constructive answers from their instructors, which, much of the time, remained unfulfilled [17]. In this regard, time is identified as a significant obstacle to distance learning during this pandemic as faculty members did not get enough time for preparing themselves for online education though it requires substantial time for developing skills [11]. Thus, the necessity to allow time for the instructors to build courses and assessment patterns for effective online education is crucial [18]. It is believed that the faculties remain unready to teach and assess students without having proper training, which also demotivates students to engage in online learning.

Student Engagement and Readiness for Online Education Design. Student participation today, tomorrow, be it offline or online, is a challenge. During the lockdown, faculties initially had a lot of dissonance towards student engagement. When the faculty began taking online classes, they were surprised to see the students' attendance, which was much higher than regular class sessions. It was almost 100%% attendance when engaging them through online education platforms [10]. Many students found that the lecturer's online interactions allowed them to engage further. If an instructor gives immediate or at least regular input, students become more inspired, increasing the students' active participation in online platforms [17].

Internet accessibility, Economic Solvency, and affordability of devices. Many emerging economies have been seen trying to collaborate with various stakeholders, including government, ICT ministry, private sector, technology providers, telecommunications network operators, and professionals in the education sector to use online platforms as a short-term crisis response. Such initiatives may theoretically be a far-reaching phenomenon to future schooling in places like Bangladesh if a proper strategy is not formulated. Hence, developing countries like Bangladesh must prepare for a stable and technology-driven education system immediately [8].

To take part in the interactive classes, students require having their computers and connections to the internet. It is quite tricky for them to avail reliable computers, laptops, and smartphones with proper internet access when they are in dire straits [9]. It is good that the number of internet users is rising rapidly all over Bangladesh and globally. Still, access to the internet is not easy as it is expensive, and hence the present economic crisis during the pandemic made it even more difficult.

Adoption of Technology. In earlier studies, some models were used involving different methods and techniques to inspect the ground realities of online education adoption by the students [17]. In recent years, social media usage such as learning feedback systems in teaching and learning has become quite widespread due to its immersive style of education, which encourages and accommodates the needs of the learners [19]. The technical and logistical advantages of online courses are appreciated as they offer flexibility, convenience, and ease of online learning. Students may not necessarily need to attend a lecture in the classroom that allows them freedom and choice and saves time and money for campus traveling [20]. However, the private universities can more effectively carry out online teaching practices as their students often come from well-to-do families and can buy the necessary interactive learning and assessment equipment and apps compared with the public university students. Approximately 70% of public university students in Bangladesh come from comparatively less solvent backgrounds and are only admitted on scholarship to universities. Most of them are scratching a living out of private tuition that has come to a halt right now [9]. Hence, it is essential to understand the impact of different factors on technology-based online education adoption on the backdrop of the challenges discussed.

2.2 Conceptual Framework

The conceptual model proposed for this study is presented in Fig. 1. This model is designed based on the discussion of earlier literature on technology adoption for higher education. The framework represents faculty readiness (FR); student readiness (SR), economic solvency (ES), and assessment system (AS) as the factors influencing technology adoption intention. Finally, the intention to adopt technology for higher education is considered to explain the adoption of online learning from a developing country perspective.

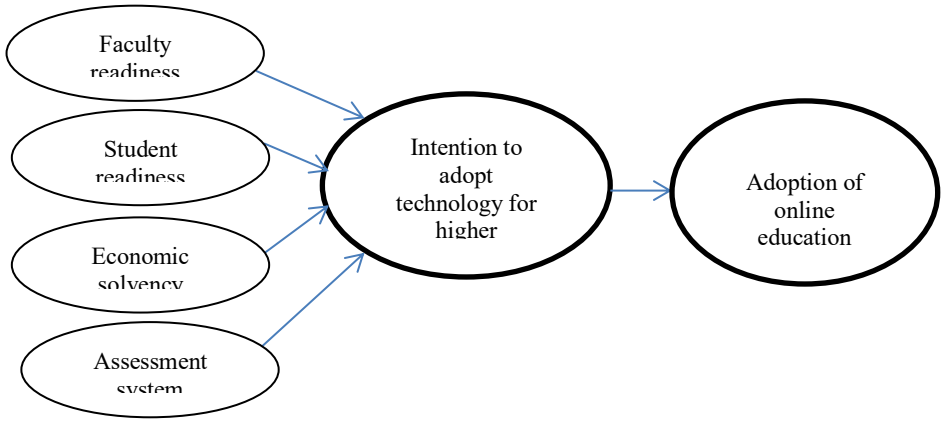

Fig.1. Proposed Conceptual Model.

The flourishing demand for distance learning has created the need for faculties to conduct classes online [21]. It is a vital fact that the online platform is comparatively new to some traditional preceptors as they are not trained enough for teaching online effectively [80][81]. Thus, it is necessary to get prepared to improve, convert, and adapt the online learning system [77] [82]. Faculty readiness (FR) is denoted as the faculty willingness and capabilities in adapting technology and organizational culture [80][83]. In the reply to a query of what level of efficiency do teachers in universities need to develop for achieving excellence in online learning, Cutri and Mena (2020) concluded that the intention to delivering quality online education is the main engine of acquiring skillsets for the new teaching method [71]. In the implementation of an effective online learning platform, cultural changes, and better time management, along with the psychological readiness of faculties, are essential to consider [58][60][71]. The analysis, thus, requires faculty readiness to recognize its significance in implementing digital classrooms.

Student readiness is another crucial issue to address while designing a technology-based learning system. Psychological readiness, skills for interactive learning, and implementation of technologies are student readiness elements [62]. Students' motivation for virtual class participation is a pivotal element of psychological readiness in digital classrooms [84][85]. We also observed different motivation theories, in which a person who feels the motive or opportunity to perform is identified as a motivator [86]. Analysis reveals that enthusiastic learners are better at learning accomplishment [87], strong in dealing with discomfort [88], and eager in digital learning participation [86]. Interactive learning skills include organizational and intellectual skills. Competencies such as teamwork, dispute resolution, and innovative thinking are the essential qualities a learner has to pursue in an integrated educational system [89]. In this regard, self-esteem is considered as one of the crucial intrapersonal abilities [62]. Learners' appraisal of their abilities typically defines self-esteem to carry out a particular task or performance [90]. Scholars recognize other essential forces, such as the availability of infrastructure and the ability to handle equipment, as the required aspect of students' technical readiness [91].

Traditional on-campus examinations have already been suspended by most universities, although the online courses will continue to be reviewed and evaluated regularly. The shift from face-to-face curriculum to a digital platform has a severe impact on assessment and evaluation. While technology was being used previously to promote education and learning, the evaluation system remained underdeveloped [92]. Implementing online assessments on the courses planned for traditional learning is a problematic activity. Students and faculty were uncertain about the process of handling unfinished tasks, projects, and other pending evaluations at the beginning of online education during this pandemic [93][94]. Professors needed to adjust the form of assessment to fit the online mode better. It is hard to track how the evaluations are to be completed online by ensuring that they do not cheat in web-based tests [95]. Again, experimental, functional, and efficiency tests cannot be carried out over the phone or online if required devices are not available. Thus, students who do not have suitable tools and smooth internet connections for better online access would

experience a substantial disadvantage when engaging in the assessment process, which will negatively impact their intention to adopt online learning [96].

Within our social lives, the economy is one of the driving forces. During the period of COVID 19, financial challenges were faced by the deprived or low-income society and the middle classes [97]. The severity of the decline in earnings can differ depending on the nature of the jobs or vocations. A significant portion of this vulnerable group of the society is active in numerous manufacturing and service industries, including the ready-made garments industry [98]. Thus, in terms of the affordability of devices for online courses, students from such families are under enormous pressure. Therefore, the degree to which economic conditions and financial stability problems influence technology-based education amid COVID 19 is a matter of concern.

Technology acceptance is represented by one's intention to adopt it [99][100]. Factors such as the enthusiasm and readiness of faculty and students to learn something new, the amount of interest they have in technology, and the excitement of using technology for teaching and learning stimulate the intention to adopt technology (IAT) for online education [37]. When people use technology and achieve a proper result from its use, they shape a positive opinion about it [101]. Many factors influencing the ability to use technology for education have been identified in earlier studies [102][103]. The idea of IAT involves, but is not constraint to, users' attitudes regarding the use of technology, instructional values and self-efficiency [104]. Earlier research explored four dimensions of IAT, namely self-efficacy for new technologies (ST), attitude towards technology (ATT), perceived usefulness of the use of technology (PEUT), and barriers to technological adoption (BTA) [105]. The research findings suggested that ST, ATT, and PEUT were significant in explaining IAT, while BTA was insignificant in predicting IAT [105]. Again, it was found in previous studies that the students' intention is converted into the adoption of virtual classes when they feel it enjoyable and satisfactory [38].

2.3 Hypotheses Development

2.3.1 Faculty Readiness. With the increase in the number of online courses offered, it is expected that the faculty will be trained to teach online [21]. Given that many faculty members are unexpectedly asked to transfer their classes to an entirely electronic world in a short time, it is necessary to take the tools they have been exposed to and how they can best utilize those into consideration [22]. Examining faculty readiness based on the values of different skills and knowledge for their online teaching is crucial. In the earlier studies, researchers found that the faculties need to ensure understanding and skills that enhance student engagement and strengthen the relationship between the instructors and the students [21][23]. Based on the literature above, faculty readiness can be considered as a crucial factor in explaining the students' intention to adopt technology (IAT) for the higher education system. So the hypothesis to be tested is as follows.

Hypothesis1: There is a significant impact of faculty readiness on IAT.

Student Readiness. Since online education demands students to have even more versatility in their study-activity, the learners must make adjustments in speed, scope, and attention to the subject, the form of media accessed, and time spent for the study. As the students' learning control aspect often becomes an essential part of the readiness [24], students are thought to be one of the main factors within universities when introducing online learning programs. It is necessary to know the learners' degree of readiness to design stable and prosperous e-learning programs to explain their intention to adopt it [25]. Hence, we developed the following hypothesis based on the above discussion.

Hypothesis 2: There is a significant impact of student readiness on IAT.

Economic Solvency. Only those with laptops and other portable devices compatible with internet access will take advantage of digital courses, leaving those from disadvantaged families behind. This phenomenon creates discontent among low-income households, and others live in poverty. The COVID 19 pandemic has mostly stopped economic development, creating further income disparity [26]. Students often state that joining in online classes is not simple for them. Students with no secure internet access fear they would not take the maximum advantage of virtual learning [27]. For ensuring a compatible device and functional internet connectivity, the economic solvency (ES) of the students is thought to be a crucial factor. Hence, as a pivotal factor to influence the students' intention to adopt technology for the higher education system, the impact of ES needs to be tested with the following hypothesis.

Hypothesis 3: Economic Solvency has a significant influence on IAT.

Assessment System. There are two forms of tests in assessing students called formative and summative [28]. Formative assessment or continuous evaluation provides the students with appropriate and frequent responses on a course's accomplishment. On another side, summative evaluation is used for the learners with a detailed insight review of just what he/she has done [29]. The use of these methods for the assessment in simulated education is a concern for educators. The dilemma also builds up further if using an appropriate LMS (Learning Management System) is not embraced. Besides, access to modern teaching tools and the understanding of using those tend to be critical issues for academic institutions. The success of the online education system rests not only in selecting the right LMS but also in instructors' creative thinking, contributing to an acceptable assessment for online teaching [30]. Thus, the proper assessment methods selection is a critical factor for adopting technology in the higher education system. Hence, the following hypothesis is constructed for testing.

Hypothesis 4: There is a significant impact of assessment system on IAT.

Intention to adopt technology. The growth of the internet with wireless technology has created the foundation of distance education. Technology-based learning refers to the provision of learning to students at anytime from anywhere through digital network devices, such as smartphones, laptops, and desktop computers [31].

Recognizing users' purpose to utilize technologies has been one of the most challenging issues for researchers, mostly in the education sector [32]. Being successful participants by adopting technology should be inclined to adapt their role in education [33]. People who perceive technology as beneficial for their activities are more inclined to utilize it [34]. So, the hypothesis constructed in this regard is as follows.

Hypothesis 5: There is a significant impact of IAT on the adoption of online education.

3 Research Methodology

The quantitative method of research is applied in this study to explore the factors influencing technology adoption in the higher education sector. This study adopted the deductive approach for analysis, which is involved in "developing hypotheses based on existing literature and then applying a testing method to support the validity of the fitted hypotheses" [35]. The analysis section of this study consists of two segments. The measurement model (MM) is evaluated first. The MM segment ensures the reliability, validity, and acceptability of the study data. The second segment proposes the Structural Equation Model (SEM) to explain the impact of selected factors on the students' intention to adopt technology, which in turn is tested to describe the adoption of online classes by them.
The study follows a systematic process. First, the fitness of the proposed model is ensured with different tests called normed fit index (NFI), comparative fit index (CFI), Tucker–Lewis index (TLI), standardized root mean square residual (SRMR), root mean square approximation error (RMSEA), and chi-square test [41][106][107]. Second, the reliability and convergent validity are assessed with factor loading, composite reliability index (CRI), Dijkstra – Henseler's rho (rA), and average variance extracted (AVE). The discriminant validity is also tested with accepted standard values of cross-loadings, Fornell-Larcker criterion, and HTMT ratio. The absence of multicollinearity is checked with the required variance inflation factor (VIF). Finally, the structural equation model (SEM) is evaluated with the coefficient of determination (R^2) and effect size (f^2) [52]. The hypotheses are tested at a 5% level of significance.

3.1 Variable Measurement

This research's theoretical framework consists of four antecedents explaining the students' intention to adopt the technology (IAT) for education. In turn, IAT reveals online class adoption by the students. Fifteen (15) questions are used to examine the predictors of IAT. There are three statements for IAT, and three statements represent the adoption of online education. The questionnaire is formed with a five-point Likert scale. The range consists of the degree starting from 1 (strongly disagree) to 5 (strongly agree) for understanding students' intention and adoption of online classes. However, based on the literature, the assessment system-related questions are marked

with the range 5 (strongly disagree) to 1 (strongly agree). At the end of the questionnaire, there is a space for the respondents to make an overall comment on the shift of education to the virtual platform. Table 1 highlights the sources of the variables taken for this study.

Table 1. Constructs, Items, and sources.

Construct		Item	Source
Faculty readiness.	FR1	My faculties are trained enough to take online classes.	[11]. [21].
	FR2	My faculties use both audio and video mode during online classes.	
	FR3	My faculties use different tools and devices for visualizing the lecture topic (Excel, Slide sharing, Lighting pad, etc.).	
Student readiness.	SR1	I can operate devices or software used for online classes.	[24].
	SR2	I do understand the lectures in online classes.	
	SR3	I am psychologically ready to use both audio and video mode during online classes.	
	SR4	I do interact with my faculty and peer during online classes.	
Economic solvency.	ES1	I can afford devices for attending online classes.	Expert Opinions [26].
	ES2	I am economically solvent to spend on online education.	
	ES3	I can afford the internet for attending online classes.	
Assessment System.	AS1	It is easy to assess in online classes fairly.	[36].
	AS2	Getting regular feedback on my performance during online classes is easy.	
	AS3	I feel the assessment system of online learning is useful for me.	
	AS4	The online assessment is not challenging for me.	
	AS5	I prefer online assessment to on-campus assessment	
Intention to adopt technology for online education.	IAT1	I want to participate in online classes.	[37].
	IAT2	Online classes are enjoyable to participate in.	
	IAT3	I am interested in online classes even when things will become normal after COVID 19 crisis.	
Adoption of online classes.	AOC1	I take part in online classes regularly.	[38].
	AOC2	I enjoy online classes, and it helps me learn a lot.	
	AOC3	I find online classes helpful.	

3.2 Research Data

The data for this research were collected primarily from the students of various universities in Bangladesh. Primary data are most suitable for this research when the problem is very recent, and secondary data is hardly adequate to study the issue. As COVID 19 is a contemporary concern for the world, the education sector's readiness to deal with this situation is quite unclear. Hence, to explain the acceptance level of online learning in Bangladesh's higher education sector during this pandemic, this study is conducted using primary data from the students of different universities.

3.3 Data Collection Procedure

A closed-ended questionnaire was developed to survey and forecast the impact of the identified predictive variables on IAT for distance learning. The questionnaire includes only one open space (optional) to describe their overall experiences on the shift of education online. The survey was conducted by sending the questionnaire to the target respondents through Google form. During this pandemic, the face-to-face survey is not safe to perform, and that is why the online survey was much more comfortable and safer both for the respondents and the researchers. It also allowed tapping students from different universities across the country.

Moreover, four interviews were taken over the phone with two educationalists, one faculty and one student involved in online education to check the questionnaire's validity and get clarity on a few issues. The final questionnaire link of Google form was sent to students of universities (respondents) through email and social media applications. The online survey has made the process easier to collect responses from different corners of Bangladesh to get reliable answers.

3.4 Sample size

The university students of Bangladesh are the respondents for this study who are doing their bachelor's and master's degrees. Students were chosen from different public and private universities in Bangladesh. Each university includes at least twelve respondents from various disciplines like science, business, social science, and humanities to maintain data neutrality. This study's sample size is 405, which met the criterion of a minimum of 384 samples for a large population size for such studies [39].

4. Results and Discussions

4.1 Demographic Characteristics

The university students of Bangladesh consist of the population of the study. Among the respondents, approximately 52% are female, and 48% are male students from different public and private universities. Most of the respondents of this study (65%)

are in the age range of 22-25 years; approximately 34% of students are between 18 to 21 years of age, and the rest of 1% respondents belong to the age group of 26-29 years. About 80% of them have experienced online classes, more or less, mostly in this pandemic situation.

In the lockdown situation, many of the students have shifted their living area as they do not need to attend physical classes. The students were asked about their living areas during the pandemic from where they participated in online courses. It is revealed that around 73% of the respondents attended classes from urban areas, and 27% were experiencing from rural areas.

The study is conducted among university-level students from different public universities, private universities, and the National University of Bangladesh. Most of the respondents (70%) are studying in private universities, while 30% are from public universities and the National University. Students studying in different departments have shared their opinion regarding online classes through the questionnaire of this study. The survey respondents include students from business studies, engineering, arts and humanities, medicine, social science, law, applied science, and other departments. 87% of the respondents are undergraduate level students, and the rest of the 13% of respondents are doing a master's degree.

4.2 Descriptive Statistics

Among others, the availability of electronic devices is crucial for attending online classes. This study's survey shows that nearly 88% of the respondents are attending online classes using a smartphone, while around 12% use laptops or a desktop to attend virtual courses. Internet accessibility is another vital element to get connected with the online platform for attending digital classes. Most of the respondents (around 75%) use Wi-Fi for internet connectivity. Approximately 25% of students use mobile data for internet access, whereas 49.1% use both of the data sources to avoid interruption in learning.

The study reveals that 77.3% of the students use the 'Zoom' app for online classes, whereas 21.7% use 'Hangout Meet.' As a learning management tool, the Google Classroom app is used by 36% of respondents.

For the assessment of the students' performance during online classes, various methods are popular to apply. As per the study's response, the assignment is vastly (70.9%) used by faculties for assessing students. Along with that, quiz tests, viva, presentations, and other tests are quite common for evaluation.

4.3 Model Specification

The model of this study has been evaluated using two steps. Measurement of the model is the first step in this process. Secondly, a structural model was used for testing the hypotheses. Composite reliability, discriminant validity, and convergent validity of the constructs were evaluated with the confirmatory factor analysis [40].

Measurement Model. An acceptable estimation is required to check the fitness of any model. For measuring the model fit, this study estimated SRMR (Standardized Root Mean Square Residual). A model with less than 0.08 SRMR value could be considered as a fit model [41]. In addition to SRMR for model fitness, experts apply various fit criteria to test research models. Typical fit indices include normed fit index (NFI), comparative fit index (CFI), Tucker–Lewis index (TLI), and the root mean square approximation error (RMSEA) [106]. Chi-square and its significance should also be reported to ensure the model's theoretical soundness [107]. According to Bollen (1989), NFI, CFI, and TLI values should be greater than 0.90, whereas the RMSEA value should be less than 0.08 with a Chi-Square p-value less than 0.05 [106].

Table 2. Model fitness report.

Model Fit Criteria	Fitness Value of the study	Acceptance Criteria	Reference	Fitness Ensured
SRMR	0.072	‹0.08		Yes
RMSEA	0.058	‹0.08	[41]	Yes
NFI	0.968	›0.90	[106]	Yes
CFI	0.988	›0.90	[107]	Yes
TLI	0.981	›0.90		Yes
χ^2	1458.826			
χ^2 Significance	0.000	‹0.05		Yes

Table 2 shows the satisfactory fitness value of 0.968, 0.988, and 0.981 for NFI, CFI, and TLI. Similarly, the SRMR and RMSEA values of 0.072 and 0.058 indicate a fit model with a χ^2 value of 1458.826 ($p‹0.05$).

The model's internal accuracy and reliability are expressed by the composite reliability index (CRI). Other than CRI, rA (Dijkstra – Henseler's rho) is used to check each construct's reliability. Each of the CRI value needs to be 0.7 or above [42]. Likewise, each of the rA requires a value of 0.7 or above [43]. In Table 3, all of the constructs' CRI and rA values are shown. All the CRIs and rAs are higher than 0.7 and fit with the required measurement. Cronbach's alpha may also be evaluated to measure the data reliability. However, it alone cannot ensure reliability as it underestimates reliability for Likert-type scales with seven or fewer options [44]. Cronbach's alpha for each variable is higher than 0.7, which is an indication of strong reliability. For convergent validity, three parameters are used. The size of the loadings is calculated first. Then, we determined the average variance extracted (AVE). Finally, the significance of the loadings is determined. The thumb's rule indicates that the outer loadings should be 0.5 or higher, and the AVE needs to be more than 0.5 as well [45]. In Table 3, all the outer loadings and corresponding AVE are greater than 0.5. Similarly, each significance value is also acceptable ($p<0.05$), as found in Table 3

Table 3. Validity and reliability scores.

Construct	Loadings	Significance	Cronbach's Alpha	Dijkstra-Henseler's rho (r_A)	CRI	AVE
AOC_1	0.758	0.000				
AOC_2	0.944	0.000	0.853	0.896	0.911	0.775
AOC_3	0.927	0.000				
AS_1	0.860	0.000				
AS_2	0.636	0.000				
AS_3	0.684	0.000	0.839	0.883	0.881	0.601
AS_4	0.804	0.000				
AS_5	0.863	0.000				
ES_1	0.881	0.000				
ES_2	0.849	0.000	0.853	0.854	0.911	0.773
ES_3	0.906	0.000				
FR_1	0.886	0.000				
FR_2	0.906	0.000	0.884	0.890	0.928	0.811
FR_3	0.909	0.000				
IAT_1	0.829	0.000				
IAT_2	0.916	0.000	0.871	0.888	0.921	0.795
IAT_2	0.927	0.000				
SR_1	0.568	0.000				
SR_2	0.835	0.000	0.761	0.819	0.845	0.582
SR_3	0.789	0.000				
SR_4	0.828	0.000				

Table Summary

Assessment	Index	Threshold	Reference	Criterion Met
Internal Consistency Measures	Cronbach's alpha	≥0.7	[44]	Yes
	Composite Reliability (CRI)	≥0.7 and AVE	[42]	Yes
	Dijkstra–Henseler's rho(r_A)	≥0.7	[43]	Yes
Convergent Validity Measures	Factor Loadings	≥0.5 given AVE≥0.5	[45]	Yes
	AVE	≥0.5	[45][46]	Yes
	Significance	P < 0.05	[42]	Yes

Table 4. Cross loadings.

Factors → Indicators ↓	AOC	AS	ES	FR	IAT	SR
AOC_1	**0.758**	0.557	0.459	0.558	0.510	0.623
AOC_2	**0.944**	0.559	0.522	0.751	0.758	0.660
AOC_3	**0.927**	0.498	0.506	0.732	0.760	0.627
AS_1	0.543	**0.860**	0.413	0.636	0.442	0.579
AS_2	0.397	**0.636**	0.309	0.393	0.192	0.489
AS_3	0.379	**0.684**	0.367	0.440	0.255	0.538
AS_4	0.494	**0.804**	0.374	0.593	0.449	0.461
AS_5	0.497	**0.863**	0.455	0.634	0.487	0.508
ES_1	0.517	0.451	**0.881**	0.477	0.447	0.524
ES_2	0.463	0.424	**0.849**	0.467	0.420	0.477
ES_3	0.498	0.437	**0.906**	0.475	0.446	0.526
FR_1	0.671	0.672	0.537	**0.886**	0.609	0.643
FR_2	0.694	0.678	0.478	**0.906**	0.636	0.646
FR_3	0.739	0.594	0.447	**0.909**	0.716	0.600
IAT_1	0.606	0.393	0.327	0.583	**0.829**	0.430
IAT_2	0.745	0.493	0.532	0.699	**0.916**	0.630
IAT_2	0.728	0.457	0.451	0.659	**0.927**	0.571
SR_1	0.360	0.422	0.494	0.333	0.274	**0.568**
SR_2	0.677	0.505	0.505	0.624	0.616	**0.835**
SR_3	0.511	0.471	0.369	0.496	0.403	**0.789**
SR_4	0.565	0.579	0.435	0.604	0.498	**0.828**

Table Summary

Assessment	Index	Threshold	Reference	Criterion Met
Discriminant validity	Cross loadings	No indicator should exhibit higher loading in any construct other than its mother construct.	[47]	Yes

Therefore, the convergent validity is confirmed for the research model as per the requirements [46].

Table 5. Fornell–Larcker criterion analysis.

	AOC	AOC	AOC	AOC	AOC	AOC
AOC	**0.881**					
AS	0.601	**0.775**				
ES	0.561	0.498	**0.879**			
FR	0.780	0.716	0.538	**0.901**		
IAT	0.781	0.505	0.498	0.729	**0.892**	
SR	0.716	0.646	0.580	0.697	0.618	**0.763**

Table Summary

Assessment	Index	Threshold	Reference	Criterion Met
Discriminant validity	Fornell–Larcker criterion.	The square root of AVE must be higher than the correlation between the construct and other constructs of the model (Hair et al., 2016)	[42]	Yes (The values in bold letter indicate it)

Table 6. Heterotrait–Monotrait (HTMT) ratio.

	AOC	AS	ES	FR	IAT	SR
AOC						
AS	0.717					
ES	0.660	0.582				
FR	0.889	0.808	0.623			
IAT	0.885	0.543	0.568	0.824		
SR	0.872	0.837	0.733	0.825	0.712	

Table Summary

Assessment	Index	Threshold	Reference	Criterion Met
Discriminant Validity.	Heterotrait–Monotrait (HTMT) ratio.	< 0.90	[42]	Yes

The discriminant validity was examined by assessing the cross-loadings. It measures the extent to which constructs are visibly distinguishable. To assess the discriminant validity, Fornell-Larcker measure [42] and Heterotrait-Monotrait (HTMT) ratio are also used widely [41]. For cross-loading, if no indicator exhibits higher loading in any construct other than its mother construct, discriminant validity is ensured. The values in this study are satisfactory, following the literature supported by earlier research [47]. The results demonstrate that the loadings of the items that have been bolded are higher than the cross-loadings (see Table 4), which satisfies the required criteria [47]. In Table 5, Fornell-Larcker values are shown. The scores ensure

that the square root of each latent variable's AVE is greater than the highest correlation it has with any other variable [42].

Table 6 shows the HTMT ratio for discriminant validity measurement with a cut-off score of less than 0.90. This test, with less than 0.90 values, is a reliable and rigorous evaluation [42]. Accordingly, the calculated values for this study provide the required validity. Thus, the study ensures the needed reliability, convergent validity, and discriminant validity.

Table 7. Collinearity Statistics.

Statistic	Loadings	Weights	T	P-Value	2.5%	97.5%	VIF
AOC_1	0.758	0.282	18.782	0.000	0.251	0.310	1.561
AOC_2	0.944	0.420	39.663	0.000	0.399	0.441	3.934
AOC_3	0.927	0.420	33.034	0.000	0.397	0.447	3.556
AS_1	0.860	0.303	16.217	0.000	0.268	0.341	2.218
AS_2	0.636	0.132	4.856	0.000	0.073	0.180	1.723
AS_3	0.684	0.175	7.653	0.000	0.124	0.214	1.803
AS_4	0.804	0.308	14.886	0.000	0.269	0.351	1.773
AS_5	0.863	0.334	14.453	0.000	0.294	0.383	2.188
ES_1	0.881	0.387	17.647	0.000	0.346	0.433	2.184
ES_2	0.849	0.364	16.173	0.000	0.319	0.407	1.876
ES_3	0.906	0.386	19.675	0.000	0.349	0.426	2.516
FR_1	0.886	0.345	29.671	0.000	0.321	0.367	2.387
FR_2	0.906	0.360	34.296	0.000	0.340	0.381	2.661
FR_3	0.909	0.405	30.950	0.000	0.382	0.433	2.474
IAT2	0.829	0.317	29.026	0.000	0.294	0.337	1.868
IAT_1	0.916	0.414	36.155	0.000	0.394	0.439	2.812
IAT_3	0.927	0.386	43.119	0.000	0.369	0.404	3.148
SR_1	0.568	0.196	6.795	0.000	0.138	0.250	1.205
SR_2	0.835	0.440	16.644	0.000	0.392	0.495	1.516
SR_3	0.789	0.288	14.532	0.000	0.247	0.325	1.738
SR_4	0.828	0.356	17.934	0.000	0.318	0.397	1.801

Table Summary

Assessment	Index	Threshold	Reference	Criterion Met
Multi-collinearity	VIF	1< VIF <4	[48]	Yes

After the reliability and validity tests, the multicollinearity is checked, and the weights are evaluated [42]. The multicollinearity is tested to identify the association gaps between items. For multicollinearity measurement, the significance level of the weights and VIF (Variance Inflation Factor) were used. The VIF value should be

above one (1) and below four (4) for avoiding multicollinearity issues [48]. For the study, VIF values presented in Table 7 match the criteria of not having multicollinearity. The weights' significance was also evaluated, and all the weights were found significant ($p<0.05$). Hence, the study's model ensures to be fit as there is no multicollinearity issue, and weights are significant [42].

4.4 Test of Hypothesis and Structural Model

The measurement model was checked above, and then the assessment of the structural model was done. R^2 value measures the explanatory ability of structure, indicating how much of the dependent variable is explained by its independent variables. For this study, bootstrapping with 5000 samples is applied, and the required results are reported. Table 8 shows an R^2 value of .568 for the dependent variable IAT (Intention to Adopt Technology). It indicates that four variables, called AS, ES, FR, and SR, can explain 56.8% variations in the IAT. The rest of the 53.2% is explainable by other variables that are not included in this study. Similarly, the second R^2 value for AOC is .611, indicating that IAT explains 61.1% variations in AOC.

Table 8. Structural Model Results.

	Beta values	Standard Deviation (STDEV)	T-Statistics (|O/STDEV|)	P Values	Hypothesis Decision	R^2
AS -> IAT	-0.122	0.056	2.195	0.028	Supported	0.568
ES -> IAT	0.109	0.056	1.963	0.050	Supported	
FR -> IAT	0.615	0.062	9.922	0.000	Supported	
SR -> IAT	0.205	0.066	3.092	0.002	Supported	
IAT -> AOC	0.781	0..026	29.668	0.000	Supported	0.611

Table Summary

Assessment	Index	Threshold	Reference	Criterion Met
Path Coefficient	Beta	$p < 0.05$	[42]	Yes

SEM (Structural Equation Model) is executed to evaluate the hypotheses of this study. All five hypotheses for this study are supported, as indicated in Table 8. The assessment system (AS) hypothesis is accepted with a beta value of "-0.122" and $p < 0.05$. Hence, it suggests that the assessment system has a negative impact on IAT. The next hypothesis indicating the impact of ES on IAT shows a beta value of 0.109 and $p < 0.05$ at a 5% significance level. Thus, the result supported the hypothesis with the indication that economic solvency has a positive effect on IAT. FR shows the highest impact on IAT among all the predictors with a beta value of .615 and $p <0.05$. Therefore, the hypothesis is accepted with the implication that faculty readiness has a positive impact on IAT. The hypothesis regarding the impact of student readiness (SR) on IAT is also supported with a beta of 0.205 and $p<0.05$. Hence, all four hypotheses related to IAT have been supported at a 5% level of significance. Finally, the hypothesis tested for evaluating the impact of IAT on AOC is accepted with the beta values of .781 and $p<0.05$. Therefore, we can conclude that IAT has a significant effect on AOC.

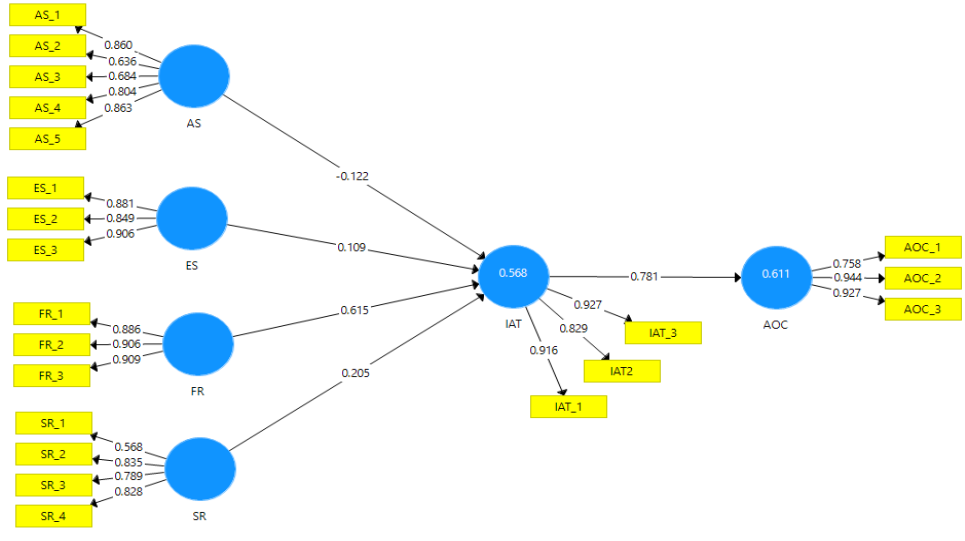

Fig. 2. Path analysis Model for AOC.

Coefficient of Determination (R^2). A coefficient of determination is a measure that indicates the predictive accuracy of a model. It is a commonly used measure to evaluate the combined effects of the exogenous latent variables on the endogenous variable in a structural model. The value of R^2 is considered satisfactory if it goes beyond 15% [49]. On the other hand, three explanatory power levels have been recommended in the earlier literature [47][50]. As per Cohen (1988), the value of R^2 with .02 is weak, 0.13 is moderate, and 0.26 is substantial [50], whereas Chin (1998) suggested that 0.19 is weak, 0.33 is moderate, and 0.67 is substantial [47].

Table 9 shows that the R^2 values for AOC and IAT are 0.611 and 0.568, respectively. Hence, the values fall under the substantial category as per Cohen (1988) and moderate category as per Chin (1998) [47][50].

Table 9. R^2 Values.

Dependent Variable	R Square	R Square Adjusted
AOC	0.611	0.610
IAT	0.568	0.563

Table Summary

Assessment	Index	Threshold		Reference	Criterion Met
Coefficient of Determination	R^2	0.19:Weak 0.33:Moderate 0.67:Substantial	0.02:Weak 0.13:Moderate 0.26:Substantial	[47] [50]	Moderate as per Chin (1998), and Substantial as per Cohen (1988).

Effect Size (f^2). Assessment of effect size (f^2) is needed to verify whether the omission of a particular construct from the research model may significantly impact its dependent constructs [51]. Eliminating an independent variable in the PLS model and applying PLS standard algorithm to attain the coefficient of determination is a standard approach [42]. Here, the obtained R^2 (construct excluded) is compared with the original R^2 (construct included) to achieve f^2. The value of f^2 ranging from .02 to .14 can be considered as a small effect size. Value in between .15 to .34 should be regarded as a medium effect size. Finally, a value with .35 and above needs to be treated as a large effect size [50]. Even a small effect size should be considered in a study to provide essential directions under different conditions [52].

Table 10. Effect size.

Endogenous Constructs	Exogenous Constructs	f^2	Effect Size
AOC	IAT	1.568	Large
	FR	0.355	Large
	SR	0.152	Medium
IAT	ES	0.027	Small
	AS	0.025	Small

Table Summary

Assessment	Index	Threshold	References	Criteria Met
Effect Size to R^2	f^2	0.02:Small 0.15:Medium 0.35:Large	[50]	IAT= Large FR = Large SR = Medium ES = Small AS = Small

Table 10 reveals the effect size of the study. Results show that IAT has a large effect on AOC with the f-square value of 1.568. Considering the impact on IAT, FR has a large effect with the f^2 value of 0.355, whereas SR has a medium effect with 0.152 f^2. Two exogenous variables called ES and AS have a small effect on endogenous variable IAT with the f^2 values of 0.027 and 0.25, respectively [50].

4.5 Discussions

Based on the conceptual model proposed in this study, the findings have been evaluated and accepted as appropriate. All the variables, namely faculty readiness (FR), student readiness (SR), assessment system (AS), and economic solvency (ES) for technology adoption intention, are accepted for the model. The R^2 value for IAT is 56.8%, which is substantial [50]. On the other hand, IAT is also tested for evaluating its explanatory power on AOC, which is accepted with 61.1% of explaining capacity. Hence, it also falls under the substantial category [50].

In the model, the hypotheses results identified that faculty readiness has the highest impact on technology adoption with a beta value of 0.615. IAT depends hugely on the ability and preparation of the instructors to embrace it. The findings are highly consistent with the recent study on online learning [71][82]. Hence, an interactive

online learning platform, technology skills, and psychological readiness of instructors are essential to consider for a thriving technology-based learning environment [58][60][71]. However, proper training to the instructors is a must to influence the students' intention to accept technology. Student readiness (beta = .205) shows that students' ability and preparation for embracing technology significantly shape their intention towards technology adoption for distance learning. Previous studies on student readiness for technology-based learning support the finding of this research in this regard [62][63][71][72]. Students' psychological and technology readiness are vital in recent research in describing their intention to adopt virtual classes, and psychological readiness in digital classrooms is mostly driven by the motivation of technology acceptance [84][85]. Thus, students need to be equipped with the necessary logistics and mental ability to ensure distance learning success as students' spontaneous participation is a crucial factor. In a developing country like Bangladesh, economic solvency is a critical issue influencing the acceptance of technology-based learning, especially when it is a matter of financial involvement. In this research, ES with a beta value of .109 ensures a significant impact on the intention of accepting technology for higher education. In a different study, it is argued that students who do not have adequate devices and smooth internet connections for better online access generally possess a negative mindset towards adopting virtual learning. Thus, economically solvent people show more interest in online classes than economically constrained students [96]. Lastly, the assessment system is found to have a significant adverse effect on IAT. The results are consistent with the respondents' remarks at the end of the questionnaire, where they were asked for their overall comments on the shift to virtual learning. The students claimed that the assessment system in the technology-based distance learning design is a significant barrier for them. They found the online assessment is mostly ineffective, leaving a challenge to initiate a comprehensive assessment system. The results are similar to the earlier research findings [92] [93][94], where it is found that instructors and students faced severe trouble when the education was shifted to an online platform amid COVID 19, primarily because of the absence of any agreed-upon online assessment system. The further explanation in support of the claim is that the assessment system was not appropriately designed when this research was conducted in the early stage of the adoption of online classes. The faculties were not sure about the best possible way to evaluate the students. They were trying different assessment strategies that made the students reluctant to online classes, as evident from their comments. The main point for their argument is that assessing them mostly through assignments is challenging as most of the universities in Bangladesh do not provide the students with access to plagiarism checkers like Turnitin and others. Hence, when the instructors check those, they find a high degree of similarity index. Assessing in mathematical courses and science and engineering courses with labs is even more challenging for them to adopt. Such aspects of online assessment made them disinclined and negatively affected the adoption of technology for distance learning. Overall, technology adoption for higher education for distance learning depends on whether the faculty members are ready to accept it and take the lead to support the students in preparing themselves with logistics and mental support to allow the technology.

Furthermore, embracing technology for higher education significantly and substantially influences online class adoption in a developing country like

Bangladesh. Finally, based on the structural model's obtained beta value, the summarization from the highest to the lowest impact can be made as FR, SR, ES, and AS on IAT. Similarly, IAT is highly influential in explaining the AOC according to the statistical result presented in this study.

The model fitness is ensured with NFI, CFI, TLI, SRMR, and RMSEA values of 0.968, 0.988, 0.981, 0.072, and .058, respectively. The Chi-Square (χ^2) value of 1458.826 ($p<0.05$) is also an indicator of the study model's fitness. The study's internal consistency reliability and convergent validity are satisfied with factors loading, CRI, and AVE as per the required criteria. Similarly, the study's discriminant validity is confirmed with accepted standard values of cross-loadings, Fornell and Larcker (1981) criterion, and HTMT ratio. The absence of multicollinearity is warranted with the required VIF. The f^2 that indicates whether the removal of a variable has a significant effect on the dependent variable is found satisfactory for the study. All the exogenous variables have either medium or large effect except for ES and AS, which have small effects on the endogenous variable. It is to be noted that even a small effect size is acceptable if other relevant parameters satisfy the requirements as found in this case [52].

The policymakers, government, and university authorities should consider the proposed model's theoretical implication and create new ways and policies to develop the online education system by ensuring supportive elements to simplifying the process. Though many of the private universities in Bangladesh have already started conducting classes online, public universities are hardly ready to accept it. Hence, it can create a gap between learners, and some might lag behind others. Similarly, students from rural areas are the worst sufferers, and they might drop out because of the solvency issue. The institutions can take initiatives to make the change and train faculties for getting prepared to take online classes and influence students to accept the new system of education. Above all, ensuring internet connectivity and affordable devices is a must for the success of the technology-based design of higher education.

5 Research Implications

5.1 Theoretical Implications

This study implies four factors as the path to influence students' intent in adopting technology in higher education and explains how intention is converted into the adoption of online classes in Bangladesh. The model proposed in this study can also be utilized by other developing countries that are new to the online learning system. This model is different from other similar studies where the faculty preparedness and student readiness and assessment systems are measured separately to explain online education adoption. For instance, Tabata & Johnsrud (2008) explored faculty readiness [11], while Stansfield et al. (2004) described student readiness in explaining the adoption of technology-based education [24]. However, this research provides a comprehensive model combining faculty readiness, student readiness, economic solvency, and assessment system. The inclusion of economic solvency has added a unique feature from a developing country perspective as such countries' economic

condition is crucial with an income disparity that leaves a specific group of unprivileged people with no way of taking part in technology with insufficient logistics. The assessment system is also considered as a potential influencing factor for newly initiated technology-based education in many countries. As students are not acquainted with this new assessment system, it has an adverse impact on them. Thus, this paper has initiated a new model for explaining the adoption of online education in the higher education system to meet the literature gap.

5.2 Practical Implications

The COVID 19 pandemic has created a significant barrier for the higher education system of Bangladesh. The education sector faced a significant stoppage because universities had been closed since 17th march 2020. The traditional method of education is almost impossible in this crisis. Thus, the only way to carry on higher education in Bangladesh is by adopting online classes as soon as possible. A few private universities in Bangladesh have already started full-fledged online learning, while many others have taken initiatives to launch. Unfortunately, public universities are way behind on adopting technology that might create a massive gap between the private and public university stakeholders. The adoption model proposed in this study has a crucial practical implication because universities, educationalists, government, and higher education policymakers in Bangladesh can use it to find a way out to move forward and protect the education sector from worsening. The whole nation can face a significant loss if it does not start practicing the new education system. The research reveals that students and faculty readiness are the crucial determinants of technology acceptance intention for schooling. It suggests that providing skill development training to strengthen teachers' attitude towards technology would be useful to promote their acceptance of the technology. Similarly, students should get both technology and psychological supports for the successful implementation of virtual learning. In addition to readiness, economic solvency is found to be a key determinant of technology-based class participation. Hence, the study recommends the policymakers to take the initiative for ensuring digital devices and internet access to the insolvent students. The government may provide a long-term interest-free loan to the students to purchase electronic devices for online education. The telecom regulators, mobile operators, and internet service providers should come forward to offer cheap cost internet data for the stakeholders to ensure participation in online classes. Lastly, the research suggests adopting a nation-wide policy for assessing students under a technology-based learning system as it is found that the new online assessment system is not satisfactory both for the teachers and the students. Thus, this study provides necessary insights into the implementation of technology for higher education through online classes from a developing country perspective.

5.3 Social Implications

Technology adoption in the education sector of Bangladesh has already created discrimination among students from rural and urban areas and private and public

universities. As per the research findings, private universities have already started taking online classes and generating concepts for the successful conduct of virtual learning to meet the demand and maintain reputation. On the contrary, students from public universities and the National University of Bangladesh are still waiting for the traditional education system, and they are not progressing in their academics. Thus, it is creating a gap between students and establishing an inequality in society. The social consequences of such discrimination are enormous that might lead to social unrest and imbalance. Such a discriminant education system should be addressed immediately. The government and higher education policymakers should take necessary steps to ensure a balanced higher education system onboarding all the students irrespective of their locality and nature of university without any further delay. This study can play a vital role by providing useful insights into the issues to focus on the successful design of technology-based online education.

5 Conclusion and Scope for Future Studies

This research aims at explaining technology adoption as an aid to the higher education system. Based on a quantitative analysis of the primary data collected from students of various universities in Bangladesh regarding their experiences and intention on technology acceptance and hence the adoption of online classes, a structural model is proposed. It can be concluded that Bangladesh's higher education system is partially ready to accept online classes for dealing with the pandemic crisis. Online classes are not preferable over traditional classes by many stakeholders yet. The noticeable matter is that most private universities have started taking online classes, faculties and students are trying to accept the technology with proper tools, devices, software, and innovative assessment methods.

Interestingly, the students' presence in online classes is almost 100%, which shows their intention to adopt it when the opportunities are available. Unfortunately, many of the students are still struggling without having such options. However, challenges like unavailability of devices and low or no internet connectivity create constraints for many disadvantaged students. The other problem is that the students struggle to cope with the new assessment systems though they are trying to adapt to the technology-based assessment methods. Economic insolvency is the other factor hindering the mass adoption of technology for higher education in Bangladesh. Overall, online education adoption during this crisis period may turn into a blessing for Bangladesh and other developing countries for the future betterment in this sector if appropriately negotiated. If the goal is to embrace a technology-based education system for the higher education sector in Bangladesh, all the stakeholders need to cooperate in overcoming the obstacles. Institutions can support students and faculties with tools and devices and provide training to the instructors for conducting useful online classes. Faculties need to motivate students and increase online engagement with them. Institutions, governments, and tech-suppliers can collaborate to avoid technological interruption. Above all, policymakers, educationalists, government, and stakeholders should take this online education as an opportunity and implement innovative approaches to make it a successful one.

The responses for primary data were collected via Goggle form within a limited duration of approximately 15 days. So, this study could not cover those students who did not have internet connectivity during this period. Such students' inclusion could make the study more comprehensive, having a better view of the issues people encounter. This research is based on the opinions of the students only. The inclusion of other higher education sector stakeholders like instructors, university authorities, and policymakers might bring different dimensions in future research. The research scope is limited within the higher education sector though primary and secondary education levels are crucial components of the whole system. Thus, research may be conducted in such areas. Lastly, this paper explored and explained an adoption model for complete technology-based online education. Hence, researchers can also study the prospects of a blended learning system in Bangladesh, which might be the future of the higher education system for both developing and developed countries.

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