MODELING USERS' CONTINUED ENGAGEMENT IN E- LEARNING IN THE POST-COVID ERA IN A DEVELOPING COUNTRY: GSCA-SEM APPROACH

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ABSTRACT

The notion of e-learning is not new to Bangladeshi HEIs. However, the tidal wave of e-learning turned into a tsunami after the outbreak, thus heightening its acceptance in developing countries like Bangladesh. Literature suggests that e-learning has several benefits a user may reap, but it also has some hurdles that may prevent a user from using it. Literature also claims that a user may discontinue using e-learning after the user has accepted it. Therefore, the study aims to identify factors propelling users to use the system for a sustained time in the post-pandemic era in a developing country. The research model of the study was tested against data from users in a developing country. To collect data from 426 respondents, the study designed an instrument comprising items adopted from prior studies conducted on a similar theme. The respondents of the study included educators working for different HEIs in Bangladesh and students enrolled in these institutions. Most of the respondents were approached on social media platforms and through email, whereas a few were approached directly with paper-based questionnaires. A standard SEM package, namely GSCA, was employed to analyze the research model. The study found a direct and positive impact of network externality and interactivity & control on continuance intention. The variables: technology support, information quality, and system quality, were identified as the components of facilitating conditions. The study urges the key decision-makers of HEIs to communicate the latest advancements in e-learning and e-learning usage with the community to expedite e-learning usage within the institutions. Infrastructure development in all aspects, providing organizational support, arranging training on usage, taking initiatives to enrich knowledge, stakeholder support, and incorporating interactive teaching and learning content into traditional teaching and learning are among the few areas where HEIs should focus on expediting the continuance intention to use e-learning. The study can be an important blueprint for the leaders of HEIs willing to facilitate and expedite e-learning, for policymakers and stakeholders looking for policies to expedite the sustained integration of educational technology, ensuring competencies and readiness to face future uncertainties, and for the commercial vendors envisioning expanding their operations in Southeast Asia. The study contributes to the theory of technology acceptance in the post-pandemic era in a developing country.

Keywords: Continued use of e-learning, developing country, IGSCA-SEM, interactivity and control, network externality, post-pandemic, SDG 4.

INTRODUCTION

During the pandemic, roughly 1.2 billion students were out of physical classrooms due to the restrictions imposed across 144 countries (L. Li, 2020; M. Uddin, 2020). Conducting academic activities online in synchronous mode was comparatively new to developing countries, such as Bangladesh. The pandemic caused a huge surge in the use of online education in Bangladesh and has continued to maintain its momentum moving forward.

As per government directives, higher education institutions were forced to fold up educational activities on March 20, 2020. Physical classes were replaced by online classes to avoid study breaks, regardless of barriers such as psychological, technical, and environmental challenges (Jameel & Real, 2020).

Understanding the technological need, a government institution called 'Bangladesh Research and Education Network (BdREN)' put forward a revolutionary initiative for providing minimal technology support, including providing access to the Zoom platform at a reduced rate to around forty-seven private and public HEIs, which made a significant surge in e-learning usage (M. Rahman, Mustahsin, & Ahmed, 2020). Likewise, HEIs started realizing the need for utilizing UGC Digital Library (UDL) E-Resources provided by UGC before the pandemic in full range, which was neglected earlier.

Despite several initiatives, attending classes online was challenging and much harder for the learners. A study revealed that 55% of students had no access to the internet to continue with online education during the pandemic (Islam, Tanvir, Amin and Salman, 2020). In addition, around 44.6% of students in Bangladesh could not attend online classes due to a lack of essential resources (M. M. Khan, Rahman, & Islam, 2021). Several challenges were confronted by the neighboring country, i.e., India; in which, apart from confronting technical and psychological issues, such as spending a long time on screen, students got engaged in other unproductive activities when the camera was turned off (Priyanka Prakash, n.d.).

At present, the Bangladeshi education sector at the tertiary level employs 30,899 educators, among whom 9,205 are female educators working for both private and public institutions. Around 15,390 educators are working for private HEIs, among whom 15,236 educators belong to public HEIs. On the other hand, a total of 1,034,320 learners, including female learners of 388,662, are enrolled in 164 HEIs in Bangladesh (Bangladesh Education Statistics, 2022).

At the very beginning, the initiative to shift online was not welcomed by the learners with open arms since they lacked resources and technicalities (Iqbal, 2021). As time went on, the community of Bangladesh began to recognize the importance of e-learning in all aspects, witnessing a huge boost in online education. The development of a robust education system by 2030, injecting online education, has been identified as essential to achieving the Sustainable Development Goals (Noor, 2023). At the beginning of the new normal era, the regulatory bodies advised the HEIs in Bangladesh to continue academic activities, implementing the blended learning approach.

The effectiveness of online education is so admired by the community that they are suggesting incorporating some advanced features that can help to include learners with disabilities (Rafa, 2024). The incorporation of a blended mode in education has even been suggested by the University Grants Commission, proposing a framework to foster blended education at the tertiary level (UGC, 2021).

Despite several initiatives taken by the government and private sector, educators of HEIs in Bangladesh confronted several challenges: technological and psychological in dealing with the transition (Rouf & Rashid, 2021). The educators also faced challenges at the primary level in the form of technological and psychological issues (Ali, 2024; A. Rahman, Islam, & Boyd, 2023). Opposing the hurdles, some educators arranged personal initiatives to conduct lessons online (Nasir Uddin, 2024).

Learning online has become a global trend, and many HEIs across the globe have invested heavily in the development of online platforms, resulting in a huge surge in online enrollment (from 30% to 70%) across the globe (Santos & M, 2022). However, in Bangladesh, the total number of internet users is around 66.94 million, with an internet penetration rate of over 38% (Hossain, 2024).

In the past few years, the government of Bangladesh has been trying to revive the education system by ensuring the use of technology and subsequently providing adequate training programs to develop digital content across the country, but challenges remain as most teachers are reluctant to conduct academic activities since they do not have competencies in dealing with technology (Nasir Uddin, 2024). The need for a skilled and

competent workforce able to adopt innovative technologies is crucial (Rakshand, 2024). The post-COVID era of Bangladesh is quite proactive, as the educational system of Bangladesh has gone through several changes, resulting in a huge boost in online classes, distance learning, and hybrid models (Kamal & Habib, 2023). As a result, several HEIs in Bangladesh have adopted various modes of online teaching. Some courses of a program are offered fully online, including the assessment, while the rest are offered on-site. In some cases, classes or sessions of a particular course are provided online, but assessments are held on campus. Moreover, full programs, including assessment, are delivered online, and these formats are expected to expand in the future.

Since March 2020, Bangladeshi academics at the tertiary level have been relying mostly on different chat-based platforms: MS Teams, Google Meet, Zoom, Cisco Webex, Adobe Connect, etc., most of which are accessible for free with limited features. At the secondary level, game-based platforms, e.g., Kahoot educational platforms, are also in high demand. Additionally, various AI-based LMSs such as Moodle, Canvas, and Blackboard offer personalized learning experiences that cater to students' needs and are highly appreciated by the users. Moreover, online course providers or education platforms, such as Khan Academy, Coursera, and EdX, with their comprehensive features and user-friendly interfaces, have generated significant interest among learners.

Following these, some social media platforms, such as Facebook and YouTube, accompanied by free messaging and video calling apps, such as WhatsApp, Viber, etc., were also utilized during the pandemic and in the new normal. Nevertheless, Massive Open Online Courses (MOOCs) or Open Educational Resources (OER) were also on the list of fewer educators, though the usage rate remained relatively low.

The notion of online learning has been explored from learners' perspectives and studied extensively across the globe, but factors influencing educators' continuous use of e-learning in developing countries are largely untapped and unexplored. Moreover, a tendency to incorporate e-learning mechanisms into traditional teaching methods by educators at the tertiary level in Bangladesh has been increasing day by day in the post-pandemic era, attracting scholars to put the phenomenon under the microscope.

Indeed, e-learning is a blessing for the global education sector. Due to the advancement of e-learning, HEIs across the globe managed the uncertainties caused by the pandemic with determination and competencies. In the new normal, the sector has turned around, leaving the drawbacks behind. However, the presence of some challenges in the post-pandemic era, such as technical issues, interaction issues, training, and literacy issues, has been highlighted in the literature (Nouraey, Bavali, & Behjat, 2023). In the context of Bangladesh, the continuity of using e-learning is still under challenge. In a study, it has been found that most of the educators at the tertiary level in Bangladesh are not familiar with technological gadgets. In addition, educators repeatedly show concern about the connectivity issues for conducting online classes (M. E. I. Khan, 2021). Furthermore, among other issues, a lack of quality e-learning resources was much stressed by the scholars (Alam, Pervez, Kabir, Amin, & Bhuiya, 2023).

With the incorporation of various e-learning tools, Bangladeshi HEIs have shown competencies in coping with unwanted situations and are proactively advancing in the digital education landscape. However, technological availability in conducting remote learning is also being questioned (Laden, 2021). Conducting assessments online is still viewed with skepticism by educators in Bangladesh, and this may prevent them from using e-learning (M. A. Islam, Nur, & Talukder, 2021). In addition, educators are struggling to deal with issues, such as poor internet connection, expensive data packages, and not having a proper environment to conduct classes from home (M. A. Islam et al., 2021). The educators began embracing e-learning during the pandemic or before the pandemic, and the extent to which they intend to continue using e-learning in Bangladesh in the post-COVID era is largely unexplored and unclear. Despite visible benefits and unforeseen challenges, the intention to continue using such types of systems is marginal. Discontinuing the use of the e-learning system after initial acceptance is a frequent occurrence (M.-C. Lee, 2010).

The study delves into understanding influential factors influencing educators' continuance intention to use Edu-tech in the traditional educational setting in the post-COVID era in Bangladesh. Scholars from diverse disciplines across the globe have continued to understand users' motivating factors to adopt e-learning; eventually, they have confirmed the positive or negative relationships of the variables, such as performance expectancy, effort expectancy, social influence, self-efficacy, facilitating condition, interactivity and control, network externality, etc. Therefore, knowing the factors forming continuance intention to use e-learning in the post-pandemic era in a developing country could be a timely initiative.

LITERATURE

E-Learning Platforms in Remote Education

Since its inception in 1990, e-learning, also known as remote learning, online learning, virtual learning, and distance education, has emerged as a paradigm to reshape the global education system. The acceptance of e-learning has grown rapidly in recent years, especially after the emergence of the pandemic the world experienced in 2020. Due to the increasing demand in recent years, the notion has gone through several advancements. According to Simonson et al. (2019), the notion of e-learning can be defined as "*The acquisition of knowledge and skills through mediated information and instruction delivered over the Internet, sometimes replacing traditional classroom instruction but often supplementing it.*" (Garrison et al. (1999) described e-learning as "*The use of electronic educational technology in learning and teaching. It encompasses various applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration.* When the learners are physically separated from the instructor, and the lessons are provided online, the concept will turn into 'Distance Education' (Moore & Kearsley, 2012). The traditional face-to-face method with techno-mediated activities will be transformed into 'Blended Learning'(Graham, 2006). When an online system is designed to allow educators and learners to conduct academic activities, such as accessing resources, submitting assignments, and communicating with peers, it will be better called a Virtual Learning Environment (VLE) (Garrison et al., 1999).

Various learning management tools (LMS), such as Moodle, Canvas, and Blackboard, have gained much attention due to their widespread features and functionality (Wang and Baker, 2020). The tools embedded with video conference features, such as Zoom, Microsoft Teams, and Google Meet, have revolutionized education in synchronous modes, speeding up real-time interaction between educators and learners during the pandemic (Ramsey, 2020).

Apart from the LMS and video conferencing tools, there are some content-creating platforms: Articulate Storyline, Adobe Captivate, and H5P, embedded with gamification elements, parallelly empowered by the educators in designing educational content attuned to the needs of the learners in hopes of providing a personalized learning experience (Hamalainen and Vahakangas, 2021). Learning environments augmented with virtual reality (VR) and augmented reality (AR) technologies: EngageVR, AltspaceVR, and ClassVR, have proven effective in delivering complex concepts, particularly in science and engineering disciplines (Dalgarno et al.,2020). Mobile-based learning services provided by Khan Academy, Duolingo, and Coursera have accelerated self-directed and micro-learning and offered flexible learning opportunities catering to the needs of modern learners ahead of their learning journey (Al-Samarraie et al.,2021).

The educators and learners perceived copious benefits of the approach. The functionality of e-learning allows users to gain access to the content at their own pace from across the globe, overcoming the geographical constraints (Allen & Seaman, 2016). The approach offers high flexibility to educators, allowing them to innovate interactive content with the platform (Kebritchi, Lipschuetz, & Santiague, 2017). E-learning provides a dynamic environment to incorporate interactive features, such as virtual labs, allowing educators to design assessments attuned to the needs of the learners (Gikas & Grant, 2013). Lastly, e-learning facilitates collaborative learning, allowing users to engage and interact with each other in a virtual setting (Bawane & Spector, 2009).

E-learning confronted several obstacles to overcome. The slogan 'Technology for All' remains under scrutiny. Accessing content in rural areas is highlighted as the most significant challenge (UNESCO, 2021). At the beginning of the pandemic, as per instructions, most educators started conducting online classes without having proper training and additional resources. To cope with the transition, educators utilized the resources that they used before the pandemic, raising serious concerns over the suitability of the content in the techno-mediated environment (Hodges, Moore, Lockee, Trust, & Bond, 2020). The study also found that the learners were frustrated as they encountered technical and environmental issues, such as unstable connection, incompatible devices, and inability to deal with technicalities, making the learning a bit chaotic (Means & Neisler, 2020). The shift also put much stress on learners' mental health and well-being as they were isolated for a while (Loades et al., 2020). The notion of e-learning has been much discussed in recent years, allowing the decision-makers to put forward initiatives to uplift the growth.

Right after the outbreak, the institutions' priority was to provide the users with a digital platform and the necessary training to carry out the task vested in them (UNESCO, 2020). Out of many modes of delivery, the asynchronous approach was prioritized effectively to cope with the situation (Al Lily et al., 2020). HEIs revived the culture of accessing digital libraries and various databases to offset the need for printed materials (Garcia, 2020).

To foster usage and encourage the users to use the provided services, various schemes and facilities were introduced, which included online technology support and a help desk (Taylor et al., 2020), financial schemes to support tuition (Adams & Williams, 2020), support to improve mental health and wellbeing (Jones, 2021), e-learning platforms to conduct and attend classes (Johnson, 2020). These initiatives helped the community mitigate uncertainties and inject quality into learning during the pandemic.

The injection of digital technology in education has been highly recognized by UNESCO, suggesting policies to propel growth (UNESCO, 2020). To do so, the roles of international organizations, government, and non-governmental organizations in fostering use behavior have been stressed highly (Anonymous, n.d.). The three areas: digital infrastructure, teacher training, and curriculum development, require funds to be operational to ensure smooth access to the resources, which can be availed by developing partnerships between HEIs and technology providers (Instefjord & Munthe, 2015).

Factors Affecting Users to Adopt E-learning

The phenomenon of e-learning has been spotted by scholars globally, pinpointing several influential factors along with the barriers to adoption. Out of many, a lack of technological backbone, such as bandwidth, hardware, and necessary software, was the line of attention in a developing country (Alenezi, Karim, & Veloo, 2011). The second barrier could be the culture, attitude, and norms of society; as such, if there is a cultural requirement to choose a traditional classroom over online learning, it may jeopardize e-learning adoption (Al-Senaidi, Lin, & Poirot, 2009).

In addition, higher satisfaction and adoption are the result of the user-friendliness of the interface of an e-learning system (Al-Fraihat, Joy, & Sinclair, 2020). A study found that the e-learning attributes, i.e., well-structured elements and interactive content, led to better learning outcomes, thus increasing adoption (Al-Harbi, 2011). High-quality content was found to be motivating for learners to adopt the e-learning system consistently (Algahtani, 2011). Organizational support, institutional policy, and strategic planning are the three broad areas where focus should be given to promote e-learning. Continuous management support and scopes for professional development were found to be essential to adopt e-learning (Alsabawy, Cater-Steel, & Soar, 2016). Further to this, e-learning policies and leadership have been found to have an impact on e-learning adoption (الحجران, اللوزي, & الدبعي, 2014). Other than technological components, e-learning acceptance was found to be influenced by some behavioral components, such as perceived ease of use and perceived usefulness (Alraimi, Zo, & Ciganek, 2015). Scholars suggested enhancing self-efficacy or confidence through training and support because these two factors were liable to engage learners with the e-learning system (Alenezi et al., 2011). Users are more likely to engage in e-learning activities when they perceive that the system is useful and easy to use and serves their learning needs (N. Islam, Beer, & Slack, 2015).

In the case of Pakistan, the influences were akin to other developing countries, where perceived usefulness and perceived ease of use were the most influential in expediting e-learning. Besides, self-efficacy, internet experience, enjoyment, and system characteristics were found to be influencing perceived ease of use, whereas system characteristics impacted perceived usefulness (Kanwal & Rehman, 2017). E-learning adoption was influenced by institutional infrastructure, staff attitudes and skills, and perceived student expectations (King & Boyatt, 2015). Information system expertise and expected benefits played pivotal roles in e-learning implementation (B. Raouf, Seger Naser, & Khireibut Jassim, 2012).

Few studies have been conducted discussing the impact of network externality or network effect. Network externality was found to be influencing users' persistence in completing MOOCs indirectly (B. Li, Wang, & Tan, 2018). Technology and the learner dimension influenced e-learning adoption (Vanitha & Alathur, 2021). Self-efficacy and interaction were found to have impacted user intention indirectly (Dash, Akmal, Mehta, & Chakraborty, 2022). The intention to use e-learning was directly impacted by one's e-learning

experience and attitude (Mailizar, Almanthari, & Maulina, 2021). Students' intention to use e-learning was found to be strongly influenced by performance expectancy, social influence, effort expectancy, and service quality (Perera & Abeysekera, 2022).

E-learning in Bangladesh

As mentioned before, e-learning is not a new concept to Bangladeshi HEIs. Due to its capability to mitigate the digital divide, the notion has gained enormous attention as an alternative to the traditional delivery mode. In addition, it has been found that the notion was well embraced by the users (e.g., learners and educators) as they believe that it is useful in viewing lessons, reading materials, completing assignments, taking part in different webinars, forums, etc. (Eltahir, 2019; Sarker, Mahmud, Islam, & Islam, 2019). However, the main drawbacks of learning online were the poorly designed content and poorly configured connectivity (Sarker et al., 2019). The scholars also suggested diminishing major downsides by taking the initiative to enrich users' knowledge and technical skills (Akter, Munira, & Amin, 2017). In addition, the development of quality and interactive content, and a user-friendly system promoting asynchronous interaction, was highlighted as the prerequisite to continued acceptance (Sarker et al., 2019). Another concept, m-learning, was introduced in Bangladesh in 2015 and was found to be useful in mitigating study gaps during the pandemic (Biswas, Roy, & Roy, 2020). In a study, it was found that system quality, information quality, and service quality influenced users' satisfaction with using m-learning (M. M. Uddin, Ghosh, & Isaac, 2019). In the post-pandemic era, performance expectancy and social influence played a pivotal role in expediting e-learning acceptance among users in Bangladesh (Maisha & Shetu, 2023).

Technology Adoption Theories and Models on E-learning

E-learning is a mode of providing education through various techno-mediated platforms (Vanitha & Alathur, 2021). Over the past few years, several models and theories have been applied to explore the adoption behavior of e-learning (Baig, Shuib, & Yadegaridehkordi, 2022). People's perceptions and attitudes toward e-learning were examined in light of Rogers' innovation adoption theory, which confirmed that the influence of cost, quality, agility, schedule control, certification of degree, and personal demand on the adoption of e-learning (Zhang, Wen, Li, Fu, & Cui, 2010). The original technology acceptance model (TAM) (Davis, 1989) was applied to understand the adoption behavior of e-learning several times globally. Computer self-efficacy was found to influence perceived ease of use, whereas content quality was found to have influenced perceived usefulness (Y. Lee, 2006). Based on TAM, the UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) the model was developed with a couple of extensions. The original UTAUT (Venkatesh et al., 2003) was applied to explain the adoption behavior of e-learning and confirmed the impact of performance expectancy, social influence, effort expectancy, and facilitating conditions on the intention to adopt e-learning and the subsequent use behavior (Perera & Abeysekera, 2022). The UTAUT 2 was applied to determine the factors predicting the behavioral intention of university students to use the e-learning platform, confirming the direct impact of the variables: performance expectancy, social influence, hedonic motivation, learning value, and habit on students' intention to use e-learning (G. Zacharis & Nikolopoulou, 2022).

The IS success model identifies the relationships among six critical dimensions, including the dimension of 'service quality' added in 2003 (W. DeLone & McLean, 2003). Due to its robustness, scholars have applied several models for assessing and developing e-learning, but this model can be useful in measuring challenges associated with e-learning (Perera & Abeysekera, 2022). The DeLone and McLean (D&M)(W. H. DeLone & McLean, 1992). The information systems (IS) success model was applied to understand how students' accessibility varies gender-wise, and it was found to have a significant and direct impact of e-service quality on system use and user satisfaction for both groups (Shams, Niazi, Gul, Mei, & Khan, 2022).

The General Extended Technology Acceptance Model for E-Learning (GETAMEL) was applied to measure students' acceptance of technology and found that subjective norms, experience of self-efficacy, and enjoyment had a positive impact on perceived ease of use, whereas self-efficacy and enjoyment had a significant impact on students' perceived usefulness (Abdullah, Ward, & Ahmed, 2016). Student's readiness for e-learning applications was measured by incorporating the TRI theory (Parasuraman, 2000) highlighting that students'

positive attitude towards e-learning gave them a feeling of optimism and innovativeness (Kaushik & Agrawal, 2021). Expectation-confirmation theory (ECT) (Bhattacherjee, 2001) was applied to understand factors leading to continued usage of e-learning technology and found that the intention to continue e-learning usage was influenced by education level, expectation, perceived performance, confirmation, and satisfaction (Chou, Lin, Woung, & Tsai, 2012).

The above literature sheds light on several aspects. Firstly, users' continuance intention to use e-learning was extensively studied before the pandemic, and few studies were made during the pandemic, but only a few studies were conducted in the post-COVID era globally. However, few studies have been conducted exemplifying Bangladesh, covering all the eras (before, during, and after). Secondly, the incorporation of variables: interactivity and control, and network externality in explaining phenomena was not seen extensively. Thirdly, the impact of facilitating conditions was seen to be studied widely without generalizing the aspects. Lastly, the application of GSCA approaches in analyzing models was not seen in e-learning. Therefore, the study was undertaken to address the above literature gaps.

DEVELOPMENT OF THE FRAMEWORK

Research Model

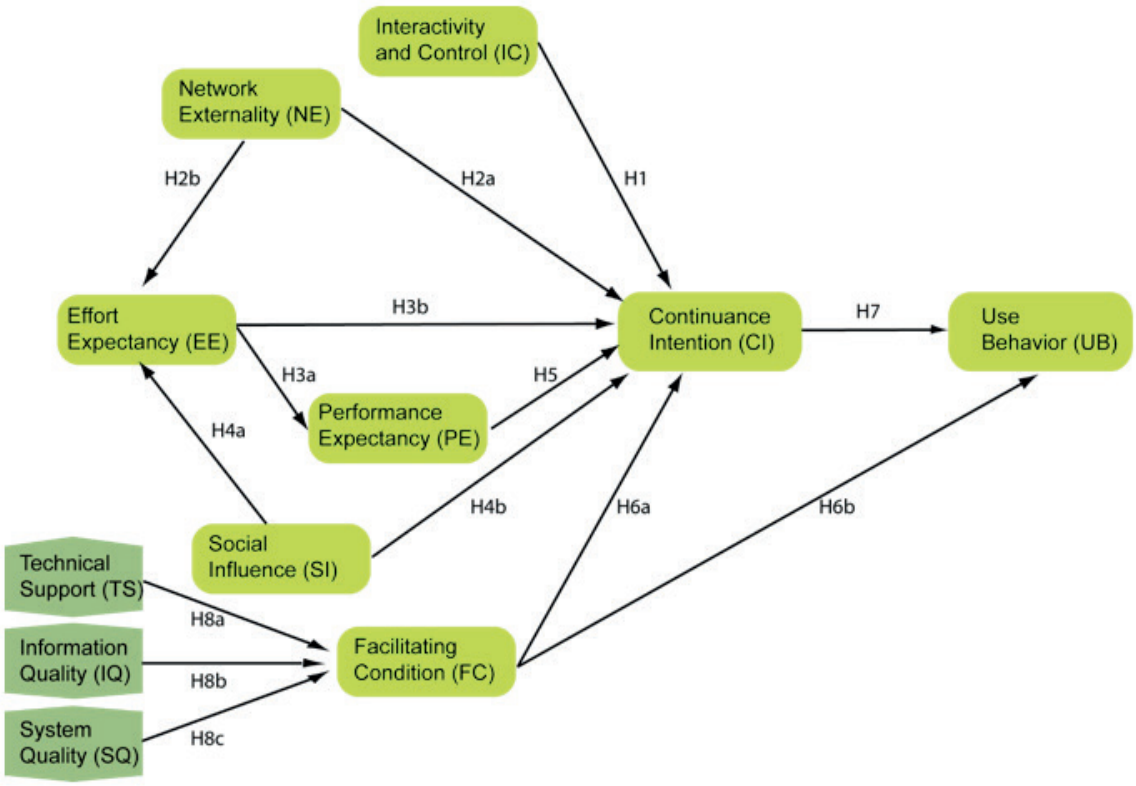

Figure 1. Integrated Model for Continued Use of Digital Learning (IMCUDL)

Source: Own illustration

Figure 1 shows the research model of the study conceptualized from prior research. The research model comprises endogenous and exogenous variables forming causal relationships between or among the variables. In the model (e.g., Figure 1), the construct "Facilitating Conditions" is the aggregation of technology support (TS), information quality (IQ), and system quality (SQ), which were declared as components of facilitating conditions in this study. The observed variables forming a component in a model are referred to as composite indicators (Bollen, 2011). Technical Support is generated by three composite indicators (TS1, TS2, and TS3). The composite indicators: IQ1, IQ2, IQ3, and IQ4 together generate the component

"Information Quality." System Quality is reflected by four composite indicators: SQ1, SQ2, SQ3, and SQ4. The model has four endogenous and four exogenous variables. Arrows point toward endogenous constructs forming causal relationships between the variables. Each of the causal relationships is conceptualized in line with the literature discussed earlier. In this model, the variables TS, IQ, and SQ are the components that together form facilitating conditions. The variables used to conceptualize the models are largely adopted from UTAUT (Venkatesh et al., 2003), the IS success model (W. H. DeLone & McLean, 1992), E-learning technology acceptance model (Martinez-Torres et al., 2008). The variable network externality (Van den Ende, Wijnberg, Vogels, & Kerstens, 2003), Interactivity, and control (IC) (Martinez-Torres et al., 2008) have been added to the model to explain the phenomena observed, which are theoretically woven. In addition, the three constructs: TS, IS, and SQ adopted from the IS success model (W. DeLone & McLean, 2003) conceptualized as the components of facilitating conditions in this study.

Model Variable and Development of Hypotheses

Interactivity and Control (IC)

Interactivity and Control can be defined as "*The system characteristics by which users could interact with each other and control the form and content of a mediated environment.*"(Martinez-Torres et al., 2008). Content, interface, and system feedback—all of which rely on interaction—showed a strong correlation with learner satisfaction, which in turn affected learners' intentions to continue learning (Kishabale, 2019). The relationship between interactivity and control (IC) and continuance intention has never been identified or shown in any study. However, Martinez-Torres et al., (2008) discovered a correlation between perceived utility and interaction and control (IC). Hence, the study proposes the following hypothesis:

H1: Interactivity and control (IC) will have a significant positive impact on continuous intention (CI) to use e-learning.

Network Externality (NE)

Network externality, also known as the Network effect (Liebowitz & Margolis, n.d.) can be defined as "*an increase in the utility of a product for a user as the number of other users of that product increases.*"(Van den Ende et al., 2003). According to Y. Lee (2002), network externality was determined to be the second most significant element influencing the adoption of e-learning, having a direct impact on usage intention, perceived usefulness, and perceived ease of use of the system. According to a study, users' perceptions of the value of technology and their intention to continue using e-learning were directly impacted by network externality (Cheng, 2014a). In a study, it was found that network externality (NE) had a direct impact on users' continuance intention to use e-learning and the perceived usefulness of technology (Cheng, 2014a). If educators or learners realize that other users are using the e-learning system, they will be motivated by the effect and try out the system (Y. Lee, 2006). The influence of NE on adoption was seen when Microsoft launched its operating system, namely Windows. The study, therefore, proposes the following hypotheses:

H2a: Network Externality (NE) will have a significant positive impact on continuous intention (CI) to use e-learning.

H2b: Network Externality (NE) will have a significant positive impact on effort expectancy (EE)

Effort Expectancy (EE)

The degree of flexibility and ease of use with which a user can use the technology of their choice is known as effort expectancy, and it is the primary determinant of the UTAUT model. Users are more likely to accept a technology when they discover that it is simple, hassle-free, and that they can operate it with little to no technical understanding (Venkatesh et al., 2003). Perceived ease of use (PEOU) and complexity are similar perspectives on EE (Utomo, Kurniasari, & Purnamaningsih, 2021). It was discovered that effort expectancy in adopting e-learning positively influenced behavioral intention to adopt e-learning, as well as performance expectancy (Mehta, Morris, Swinnerton, & Homer, 2019). Furthermore, according to Boateng, Mbrokoh, Boateng, Senyo, and Ansong (2016), perceived usefulness was positively impacted by perceived ease of use. Therefore, the study proposes the following hypotheses:

H3a: Effort Expectancy (EE) will have a positive and significant impact on Performance Expectancy (PE)

H3b: Effort Expectancy (EE) will have a positive and significant impact on continuous intention (CI)

Social Influence (SI)

"*Social influence is the degree to which a person perceives or prioritizes the importance of other people's beliefs and viewpoints about using technology.*" (Venkatesh et al., 2003). Students' behavioral intention to use e-learning was highly influenced by social learning (Tarhini, Masa'deh, Al-Busaidi, Mohammed, & Maqableh, 2017). This variable was formed in part by constructs including image, social circumstances, and subjective norms (Utomo et al., 2021)). According to Mehta et al. (2019), social influence had a beneficial impact on both behavioral intentions to adopt e-learning and performance expectancy. In a developing country, social influence positively influences behavioral intention to utilize e-learning (Maisha & Shetu, 2023). As a result, we postulated the following connections:

H4a: Social Influence (SI) will have a positive impact on effort expectancy (EE)

H5b: Social Influence (SI) will have a positive impact on continuous intention (CI)

Performance Expectancy (PE)

The degree to which users believe that utilizing the system will help them achieve their academic goals is known as performance expectancy, and it includes benefits and usefulness (Venkatesh et al., 2003). The expectation for effort and performance in e-learning both have a significant impact on how long people use it. Users are more likely to adopt e-learning if they believe it to be beneficial (M.-C. Lee, 2010). Combining elements, including perceived utility, external incentive, work fit, relative advantage, and outcome anticipation, resulted in performance expectancy (Utomo et al., 2021). According to Boateng et al. (2016), perceived usefulness did not affect e-learning intention behavior, but perceived simplicity of use had a favorable effect. The researcher, therefore, postulates the following hypothesis:

H5: Performance Expectancy (PE) will have a significant positive impact on continuous intention (CI)

Facilitating Condition (FC)

Facilitating conditions can be defined as "*the degree to which an individual believes that an organization and technical infrastructure exist to support the use of the system.*" (Venkatesh et al., 2003). The construct was built upon the idea of the perceived availability of internal and external resources (Park, Lee, & Yi, 2011). Factors, such as knowledge, resources, opportunities, and advice from marketers and peers, can reflect the construct (Venkatesh et al., 2003). Facilitating conditions can be reflected by network coverage or device operating system (Mahardika, Thomas, Ewing, & Japutra, 2019). Facilitating conditions encompass perceived behavioral control, facilitating conditions, and adaptability (Utomo et al., 2021). In the original study, it was declared as an independent variable. Facilitating Conditions, including accessibility to technological devices (laptops, smartphones, etc.), stable internet connection, training program, and non-technical external control, such as legal and regulatory protection, guidance, and control (Lu, Yu, & Liu, 2005) influences both intention and actual behavior (G. Zacharis & Nikolopoulou, 2022). The construct was conceptualized from compatibility, perceived behavioral control, and facilitating conditions taken from several models, such as TPB, CTAMTPB, MPCU, and IDT (Marikyan, 2023).

Facilitating conditions can be individual, i.e., individual abilities and knowledge, or organizational, such as infrastructure, and stakeholder support (Park et al., 2011). Facilitating conditions were reflected by financial resources, infrastructure, human resources, and educational content (Paul, Musa, & Nansubuga, 2015). Facilitating conditions were found to have influenced the perceived usefulness (Teo, 2010). A study confirmed the influence of facilitating conditions on perceived usefulness and perceived ease of use (Park et al., 2011). Based on the above discussion, the study therefore proposes the following hypotheses:

H6a: Facilitating Condition (FC) will have a positive impact on continuous intention (CI)

H6b: Facilitating condition (FC) will have a positive impact on use Behavior (UB)

Continuance Intention (CI)

Numerous studies identified continuance intention as the predicted variable. In the context of e-learning, the variable continuance intention was influenced by several predictors. On the other hand, the variable use behavior is a strongly predicted variable of continuance intention. In several studies, use behavior was influenced by facilitating conditions. Therefore, the researcher proposes the following hypothesis:

H7: Continuous intention (CI) will have a positive impact on use behavior (UB)

Technical Support (TS), Information Quality (IQ), and System Quality (SQ)

Technological dimensions underlie system quality, information quality, and service quality, which are the predictors of the variables: perceived usefulness and satisfaction in adopting e-learning (Vanitha & Alathur, 2021). Furthermore, the literature also clarifies the context of technology, which is composed of system quality, infrastructure, perceived ease of use, and learning experts (Ansong, Boateng, Boateng, & Effah, 2016). The effect of content quality was found to significantly influence the perceived usefulness of adopting an e-learning system (Y. Lee, 2006). E-learning content had an insignificant relationship with the intention to use e-learning, but had a positive significant relationship with users' satisfaction (Dash et al., 2022). In a study, system quality, content, information quality, and service quality have been labeled as components suitable for measuring e-learning system success (Hassanzadeh, Kanaani, & Elahi, 2012). System quality is reflected by flexibility and sophistication, whereas information quality is reflected by content and format(Gorla, Somers, & Wong, 2010). According to W. DeLone & McLean (2003), the quality of content produced by a system is known as "Information quality." It is also conceptualized as the ease of retrieving information stored securely (Y. W. Lee et al., 2002).

Gorla et al., (2010) introduced five constructs, such as content, accuracy, format, ease of use, and timeliness. System quality positively impacts information quality (Gorla et al., 2010). Ensuring necessary resources and support systems to expedite or facilitate the use of the system is a part of facilitating conditions. This can be ensured through collaboration with the technology provider, government agencies, and funders to secure necessary resources, such as infrastructure, funds, and technical assistance. Efforts on human capital development by offering training and professional development initiatives may aid the users in adopting emerging technologies (James, 2023). In this study, the construct "Facilitating Condition" is seen as a summary of the aggregation of observed variables of the constructs: technical support, information quality, and system quality. On the other hand, scholars identified several dimensions of the variable 'facilitating conditions' which are documented in the literature.

The term 'Network Coverage and operating system' was compared with the facilitating condition (Mahardika et al., 2019). Similarly, knowledge, resources, opportunities, and advice from marketers were narrowed down to the notion of facilitating conditions (Venkatesh et al., 2003). The term 'facilitating condition' is also compared with network coverage and the operating system of a device (Mahardika et al., 2019). In a study, it was shown that the concept of FC was originally theorized from perceived behavioral control and adaptability (Utomo et al., 2021). FC ranges from providing access to technological devices, such as laptops and smartphones, and a stable internet connection, etc., to non-technical external control, i.e., legal, and regulatory protection, guidance, and control (G. Zacharis & Nikolopoulou, 2022). In addition to that, FC also encompasses organizational support, including infrastructure and stakeholders (Park et al., 2011). Resources—including financial, infrastructural, and human, as well as educational content—are encompassed within the concept of FC (Paul et al., 2015). Based on the above findings on facilitating conditions, we formulate the following hypotheses:

H8a: Technical Support (TS) will be a component of the Facilitating Condition (FC)

H8b: Information Quality (IQ) will be a component of the Facilitating Condition (FC)

H8c: System Quality (SQ) will be a component of the Facilitating Condition (FC)

Use Behavior (UB)

In various studies, the concept of use behavior has been identified as the predicted variable of several factors. In the context of higher education, the notion is conceptualized as the way students use mobile devices for educational purposes (G. K. Zacharis, 2020).

RESEARCH DESIGN AND METHODOLOGY

Research Setting, Instrument, and Measure

The researcher conducted explanatory research to understand how the independent variable impacts the dependent variable in a non-contrived setting (field study)(Bagram & Altaf, 2009). The study adopted a survey approach, in which a structured and self-administered questionnaire comprising both open-ended and closed-ended items was designed by reviewing articles, case studies, and newspaper columns centered on a similar theme.

Table 1. Measurement Items and Sources

Variables	Items (Codes)	Statements	Adopted from
Performance expectancy (PE)	PE1	Using online tools enables me to accomplish my academic needs more quickly and efficiently.	(Almaiah, Alamri, & Al-Rahmi, 2019; Venkatesh et al., 2003)
	PE2	Using online tools enables me to accomplish tasks quicker than conducting classes face-to-face on campus.	
	PE3	Using online tools would improve my teaching performance.	
	PE4	Online tools enhance equity between all students (Example: The System offers an equal chance for students to carry out tasks and communicate with faculty)	
	PE5	Using online tools increases the quality of the teaching process.	
	PE6	Using online tools would enhance my effectiveness in teaching.	
Effort Expectancy (EE)	EE1	Learning to operate the e-learning tool (e.g., MS Teams, Google Classroom, Moodle) is easy for me.	(Chao, 2019)
	EE2	My interaction with the tool (e.g., MS team) is clear and understandable.	
	EE3	I would find the systems easy to use.	
	EE4	It is easy for me to become skillful in using the systems.	
	EE5	I would find it easy to get the online systems to do what I want it to do.	

Social Influence (SI)	SI1	My coworkers who influence me a lot think that I should use the Online systems.	(Venkatesh, Thong, & Xu, 2012)
	SI2	People (e.g., family members, opinion leaders) who are important to me think that I should use the system.	
	SI3	In general, my institution has supported the use of the system.	
Interactivity and Control (IC)	IC1	The e-learning system enables interactive communication between the instructor and students.	(Martinez-Torres et al., 2008)
	IC2	The e-learning system facilitates interactive communication between students and educators.	
	IC3	The communicational tools in the e-learning system (chat, e-mail, and forum) are effective in facilitating interactivity between the users.	
	IC4	The e-learning system provides an opportunity to control communication between instructors whenever students require it.	
	IC5	The e-learning system allows for the control of the learning sequence.	
Network Externality (NE)	NE1	Most educators in my department use the e-learning system.	(Cheng, 2014a)
	NE2	Most educators in my faculty use the e-learning system.	
	NE3	Most educators in my university use the e-learning system.	
	NE4	As more and more educators use the e-learning system, I think related services and support will soon be developed.	
Facilitating Condition (FC)	FC1	I have the resources necessary to use the e-learning system.	(Venkatesh et al., 2003)
	FC2	I have the knowledge necessary to use the e-learning system.	
	FC3	My institution provides support services or a center for dealing with technical issues of the e-learning system.	
	FC4	I have a flawless internet connection to support the use of e-learning tools at home or in the office.	
	FC5	To me, the Internet connection I use is not costly.	
	FC6	I always have access to a high-speed Internet connection from anywhere to use online systems to conduct classes and assessments (e.g., quizzes, and case studies).	
	FC7	The device I use to get connected is quite advanced and compatible.	
	FC8	All payments related to internet connection and recharge are paid using a mobile wallet, such as bkash, or Rocket.	

Continuance Intention (CI)	CI1	I intend to use the tools in the future if an opportunity is given.	(Bhattacherjee, 2001; Cheng, 2014a)
	CI2	I plan to use online systems in the future whenever needed.	
	CI3	I predict I will use the system whenever I get instructed.	
	CI4	I would recommend this platform to my friends.	
	CI5	I intend to continue using the e-learning system in the future.	
Use Behavior (UB)	UB1	I prefer to conduct classes and take all assessments online if there is a need for this.	(Ifinedo, 2012)
	UB2	I like to use online platforms for educational purposes.	
	UB3	I often use e-learning platforms to boost my knowledge.	
	UB4	I very often use e-learning to conduct classes.	
Technical Support (TS)	TS1	The e-learning system tool provides useful assistance online when there is a problem.	(Tsai, 2015)
	TS2	E-mail inquiries can be made with the service provided when there is a problem.	
	TS3	The e-learning system offers good technical support	
Information Quality (IQ)	IQ1	The e-learning system provides a wealth of high-quality learning resources.	(W. DeLone & McLean, 2003)
	IQ2	The e-learning system provides courses with clear learning objectives.	
	IQ3	The e-learning system provides courses covering the main points.	
	IQ4	The courses offered by the e-learning system are very attractive to me	
System Quality (SQ)	SQ1	The e-learning system runs stably.	(W. DeLone & McLean, 2003)
	SQ2	The e-learning system has a fast response speed.	
	SQ3	The e-learning system has perfect functions.	
	SQ4	The e-learning system interface design is reasonable.	

The questionnaire of the study consisted of two parts. Part one comprised questions about the demographics of the respondents, whereas part two comprised questions to measure the factors impacting the continuance intention to use e-learning. All the questions in part two were distributed under eleven constructs. Questionnaire items were primarily selected from prior studies conducted on similar themes and contexts. The determinant 'Performance Expectancy' was measured by six observed variables: PE1 to PE6, and were adopted from (Almaiah et al., 2019; Venkatesh et al., 2003). The construct 'Effort Expectancy' was measured

by five items: EE1 to EE5, and largely adopted from (Chao, 2019). The unobserved variable 'Facilitating Condition' was measured by three observed variables: FC1, FC2, and FC3, and the observed variables were adopted from prior studies (Venkatesh et al., 2003). The latent variable 'Interactivity and Control' was measured by five statements (IC1 to IC5), which were adopted from a study (Martinez-Torres et al., 2008). The predictor 'Network Externality' was measured by items (NE1 to NE4) adopted from a study (Cheng, 2014). The dependent variables: Continuance Intention and Use Behavior were separately measured by items adopted from studies (Bhattacherjee, 2001; Cheng, 2014a) and (Ifinedo, 2012), respectively. The three items (TS1 to TS3) related to the component 'Technical Support' were adopted from the literature (Tsai, 2015). The remaining two components, Information Quality and System Quality, were measured by items adopted from the literature (W. DeLone & McLean, 2003). All the statements were measured in seven-point Likert scales ranging from Strongly Disagree (1) to Strongly Agree (7)(Ejdys, 2021).

Participants

Respondents of the study were users, including educators and learners of public, private, and international universities located across the country. The study covered only the full-fledged universities running under UGC guidelines. The study incorporated responses collected from users, including educators and learners at all levels of tertiary education in Bangladesh, including learners studying in public, private, and international HEIs operated in various regions, including urban and suburban areas throughout Bangladesh. The study is centered on identifying factors explaining e-learning adoption in the post-pandemic era in a developing country. A purposive non-probabilistic sampling technique (heterogeneous sampling) was opted for to reach out to the respondents, such as educators and learners. In purposive sampling, individuals are selected based on some criteria, and the research is guided by a quantitative research design (Rai & Thapa, 2015). To study the relationships, we employed the most suitable method, called the hypothetico-deductive method, in which the hypotheses were hypothesized based on theoretical and empirical contributions (Alami & El Idrissi, 2022). Hence, the study is positioned within positivist philosophy.

Data Collection Technique

Researchers designed an instrument comprising measures and scales largely adopted from prior studies. The instrument was handed out to approximately one hundred and thirty educators from thirty-five universities across the five divisions in Bangladesh for recording responses on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). In the first round, a total of one hundred and six educators from twenty-seven universities responded, with a response rate of 81.53%. In the second round, a total of three hundred and fifty students from twenty-two institutions were invited to the survey. The link to the instrument was posted on a social media platform, i.e., Facebook. After carefully examining the data and minimizing non-response errors, the researchers validated the responses of four hundred and twenty-six participants, which exceeds the suggested sample size.

The sample size of the study was determined using a tool called G*Power, and the suggested sample size was 423. When determining the sample size, we opted for 0.80 as power on the G*Power tool, and the effect size and error were set to 0.10 (small) and 0.11, respectively (Faul, Erdfelder, Lang, & Buchner, 2007, p. 3)

Data Analysis

Scholars have incorporated various approaches to data analysis, such as CB-SEM and PLS-SEM, over time. Data analysis approaches are chosen depending on the research model and relationships identified between and among the variables. A researcher may opt for a simple OLS approach in a model where the independent variables are truly independent. PLS-SEM will be an excellent choice if the model is conceptualized using factors or determinants. In a situation where researchers need to conceptualize both the factors and components to understand a phenomenon, IGSCA-SEM is preferred over PLS-SEM. GSCA is the most general method for component-based SEM that can deal with models having both the components and factors (Hwang, Cho, & Choo, 2023).

In this study, collected data was coded into a spreadsheet and eyeballed to identify missing and non-response errors. The Excel dataset was taken to SPSS version 26 to generate descriptive analysis. To test hypotheses, GSCA Pro software was employed. A GSCA (Generalized Structured Component Analysis) Pro is a standalone structural equation modeling (SEM) software that implements three statistical methods for estimating models (Hwang, Cho, & Bank, 2021). Generalized structured component analysis (GSCA) is a component-based approach to structural equation modeling (Hwang & Takane, 2004). It has been argued that the SEM method developed for one domain and used for another may provide biased solutions (Hwang, Cho, et al., 2023). Studies show that IGSCA tends to perform better than PLS under various conditions (Hwang et al., 2021). Also, the method is a non-parametric method that does not require any distributional assumption, such as multivariate normality.

Despite limitations in estimating the mediation effect, the approach has emerged in marketing and psychometric literature as an alternative to structural equation modeling (Henseler, 2012). The use of the GSCA approach can be seen in health information systems, retail businesses, e-learning, digital libraries, financial technologies, websites, and more. The study's research model comprises factors and components together; hence, the IGSCA module of the GSCA software is more suitable for the analysis. The GSCA (Hwang et al., 2021) tool has three standalone modules: GSCA (model comprising components only), GSCAm (model comprising factors only), and IGSCA (model comprising factors and components). Depending on the research framework, a researcher can employ any of these.

Ethical Consideration

Research is a coordinated process that requires cooperation among many people in different disciplines; therefore, ethical standards are essential for any collaborative work (Gajjar, 2013). The study followed ethical principles to meet the global standard and increase acceptance of the results. The research was conducted with a substantial level of integrity, avoiding falsification, fabrication, and misrepresentation of data at any stage of reporting. The research instrument was shared with scholars working in similar areas for possible feedback and adjustment. The study did not use unpublished data other than researchers' survey results, and proper credits were cited where necessary to avoid plagiarism. The option for the 'third gender' was opted for under the gender category in the questionnaire to avoid discrimination based on sex and race. In addition, anonymity was maintained as individual data was not presented in the report. Respondents were given enough information about the research, the researcher, and the scope to establish contact further. Throughout the study, no monetary benefits or benefits in other forms were given to the respondents. The researcher did not violate any policies imposed by the institutions.

ANALYSIS AND RESULTS

Respondents' Profile

Table 2. Demographics of the respondents (N= 426)

Variables	Categories	Frequencies	Percentage
Participants and Gender	**Educators**		
	Male	77	18%
	Female	29	7%
	Learners		
	Male	215	50%
	Female	105	25%

Age	18-24	246	57.60%
	25-24	109	25.58%
	35-44	53	12.44%
	45-54	10	2.34%
	55-64	5	1.17%
	Above 64	3	0.70%
Academic fields	Technical (Science, Engineering)	171	40%
	Non-technical (Business, Economics, Law, and Social Science)	193	45%
	Both technical and non-technical	62	15%
Location	In Dhaka city	301	71%
	City outside Dhaka	125	29%
Usage status	More than three years	128	30%
	Less than three years	298	70%

Source: Survey result

As shown in Table 2, the participants of the study were educators (25%) and learners (75%) of different HEIs running under UGC guidelines, of whom 78% were male and 32% were female respondents. Among the educators, 18 % were male, and the remaining 7% were female respondents. In addition, the percentage of male and female respondents among learners was 50% and 25%, respectively. The majority (57%) of the respondents were aged between 18 and 24 years old. In addition, almost one-third of the respondents were between 25 and 24 years old. However, around 12% of participants belonged to the category of 34-44. Only 2.34% were between 45 and 54, and less than 1 % were aged over 64 years old.

Forty percent of the respondents were from a technical background. Conversely, 45% of the respondents were from a non-technical background. However, 15% of respondents were from both technical and non-technical backgrounds. Two-thirds (71%) of respondents resided in Dhaka city, and the remaining 29% lived in cities outside Dhaka. The usage status of e-learning shows an interesting scenario. The majority (70%) started using e-learning after the spread of the disease. Thirty percent of the respondents said that they were exposed to e-learning before the pandemic.

In addition, IGSCA was employed to estimate the research model. Considering 95% confidence intervals, the study prioritized 1000 bootstrap samples (Hwang, Sarstedt, Cho, Choo, & Ringle, 2023) to calculate the following model estimates.

Model Fit

Model Fit Measures

Table 3. Fit measures

FIT	FITs	FITm	GFI	SRMR
0.735	0.23	0.861	0.956	0.081

Source: Survey result

GSCA Pro provides several indices, such as GFI, SRMR, and FIT, to assess the adequacy of the overall model. As shown in Table 1, the calculated GFI value is 0.956, which is higher than the threshold of 0.91, and the estimated SRMR is 0.081, which is less than the cutoff of 0.10 (Hwang, Cho, et al., 2023). Overall, 73% of the total variance in all variables is explained by the model. In addition, the structural model explains 23% of the total variance of all components. Moreover, the measurement model explains 86% of the total variance in all indicators.

Measurement Model

Measurement Model Estimates for Factors

Table 4. Estimates for factors.

Factor/component	Indicator	Estimate	Loading SE	95% CI
Network Externality (NE)	NE1	0.84	0.027	0.788
	NE2	0.932	0.015	0.9
	NE3	0.847	0.029	0.788
	NE4	0.58	0.05	0.473
Effort Expectancy (EE)	EE1	0.744	0.036	0.677
	EE2	0.865	0.029	0.803
	EE3	0.822	0.03	0.763
	EE4	0.706	0.042	0.618
	EE5	0.675	0.044	0.586
Social Influence (SI)	SI1	0.928	0.035	0.804
	SI2	0.602	0.051	0.506
	SI3	0.506	0.054	0.405
Performance expectancy (PE)	PE1	0.573	0.044	0.484
	PE2	0.579	0.041	0.509 (Eliminated)
	PE3	0.754	0.043	0.667
	PE4	0.634	0.038	0.563 (Eliminated)
	PE5	0.755	0.04	0.676
	PE6	0.807	0.044	0.718
Interactivity and Control (IC)	IC1	0.836	0.031	0.77
	IC2	0.813	0.032	0.742
	IC3	0.721	0.037	0.645
	IC4	0.775	0.029	0.719
	IC5	0.684	0.039	0.609
Continuance Intention (CI)	CI1	0.763	0.042	0.678
	CI2	0.842	0.03	0.785
	CI3	0.806	0.028	0.753
	CI4	0.776	0.032	0.708
	CI5	0.811	0.03	0.757
Use Behavior (UB)	UB1	0.657	0.051	0.551
	UB2	0.768	0.048	0.686
	UB3	0.773	0.038	0.699
	UB4	0.603	0.061	0.504
Facilitating Condition (FC)	FC1	0.584	0.046	0.498 (Eliminated)
	FC2	0.338	0.066	0.202 (Eliminated)
	FC3	0.471	0.049	0.376 (Eliminated)
	FC4	0.797	0.035	0.733
	FC5	0.669	0.041	0.591
	FC6	0.73	0.052	0.632
	FC7	0.653	0.041	0.567 (Eliminated)
	FC8	0.546	0.052	0.436 (Eliminated)

Source: Survey result

All the estimates of the indicators are presented in column three of Table 4. From the above table, it can be seen that the estimates are above 0.40. In addition, a total of forty statements, which were distributed under eight factors, were analyzed using the IGSCA module of the GSCA tool, seven of which were eliminated for not achieving the cutoff points of a standard loading and adjusting the AVE values of the factors. Finally, the model was analyzed with thirty-three statements (indicators).

Measurement Model Estimates for Components

Table 5. Estimates for components.

		Weights			Loadings		
Construct	Indicators	Estimate	SE	95% CI	Estimate	SE	95% CI
Technical Support (TS)	TS1	0.473	0.019	0.439	0.827	0.02	0.786
	TS2	0.453	0.018	0.419	0.792	0.029	0.725
	TS3	0.378	0.023	0.328	0.662	0.049	0.549
Information Quality (IQ)	IQ1	0.347	0.019	0.319	0.755	0.03	0.695
	IQ2	0.346	0.016	0.316	0.786	0.026	0.73
	IQ3	0.319	0.015	0.285	0.704	0.037	0.627
	IQ4	0.32	0.016	0.289	0.754	0.031	0.685
System Quality (SQ)	SQ1	0.303	0.011	0.279	0.839	0.018	0.799
	SQ2	0.303	0.01	0.285	0.86	0.019	0.82
	SQ3	0.30	0.01	0.278	0.883	0.014	0.851
	SQ4	0.277	0.01	0.259	0.798	0.026	0.742

Source: Survey result

A total of eleven statements were analyzed in the module. As shown in Table 5, all estimates of the composite indicators distributed under the three components were loaded well, and the weights were of good size. From the above table, the weights of composite indicators of each of the components are closely related. All the loadings and weights are statistically significant because none of their 95% CIs contain zero, suggesting that the indicators are forming the corresponding components. Component loading estimates are statistically significant and large, suggesting that the components are highly related to their corresponding indicators.

Discriminant Validity Analysis

Fornell-Larcker Criterion Analysis

Table 6. Fornell-Larcker Criterion Analysis

	TS	IQ	SQ	NE	EE	SI	PE	IC	CI	UB	FC
TS	**0.764**										
IQ	0.505	**0.75**									
SQ	0.484	0.74	**0.845**								
NE	0.53	0.479	0.445	**0.811**							
EE	0.447	0.601	0.558	0.468	**0.766**						
SI	0.486	0.642	0.555	0.503	0.651	**0.702**					
PE	0.478	0.807	0.591	0.392	0.599	0.692	**0.728**				
IC	0.592	0.634	0.557	0.499	0.5	0.638	0.627	**0.768**			
CI	0.464	0.6	0.607	0.542	0.76	0.609	0.603	0.569	**0.80**		
UB	0.424	0.718	0.719	0.518	0.705	0.676	0.63	0.593	0.859	**0.704**	
FC	0.305	0.488	0.487	0.212	0.359	0.485	0.416	0.492	0.262	0.423	

Source: Survey result

Fornell-Larcker criterion analysis was conducted to check the discriminant validity of the measurement model. All the square roots of AVE values are higher up, bolded, and placed diagonally. As shown in Table 6, the value of each column is higher than the corresponding values of the same column, except for two variables: IQ and CI. The researcher, therefore, checked HTMT (Heterotrait–Monotrait) values for eight factors to check the factors' discriminant validity. As shown in Table 8 and Figure 2, it can be seen that all the values are below 0.9 or .85 (Hwang, Sarstedt, et al., 2023). Therefore, it can be claimed that the discriminant validity was well established. In addition, the constructs are positively correlated, and the strengths are marked as strong.

Structural Model

IGSCA's Estimates of Path Coefficients in the Structural Model

Table 7. Estimates for path coefficients.

Hypotheses	IV	DV	Estimate	SE	95% CI		Result
H7	CI	UB	0.803	0.038	0.708	0.856	Supported
H6b	FC	UB	0.213	0.045	0.129	0.304	Supported
H6a	FC	CI	-0.124	0.047	-0.215	-0.026	Not Supported
H1	IC	CI	0.174	0.078	0.014	0.315	Supported
H2a	NE	CI	0.158	0.058	0.048	0.272	Supported
H3b	EE	CI	0.54	0.077	0.387	0.683	Supported
H5	PE	CI	0.139	0.072	-0.005	0.273	Not Supported
H4b	SI	CI	0.03	0.083	-0.136	0.19	Not Supported
H2b	NE	EE	0.188	0.067	0.056	0.319	Supported
H4a	SI	EE	0.557	0.063	0.427	0.674	Supported
H3a	EE	PE	0.599	0.049	0.493	0.68	Supported
H8a	TS	FC	0.139	0.061	0.083	0.259	Supported
H8b	IQ	FC	0.27	0.077	0.113	0.42	Supported
H8c	SQ	FC	0.269	0.085	0.118	0.434	Supported

Source: Survey result

Structural Model

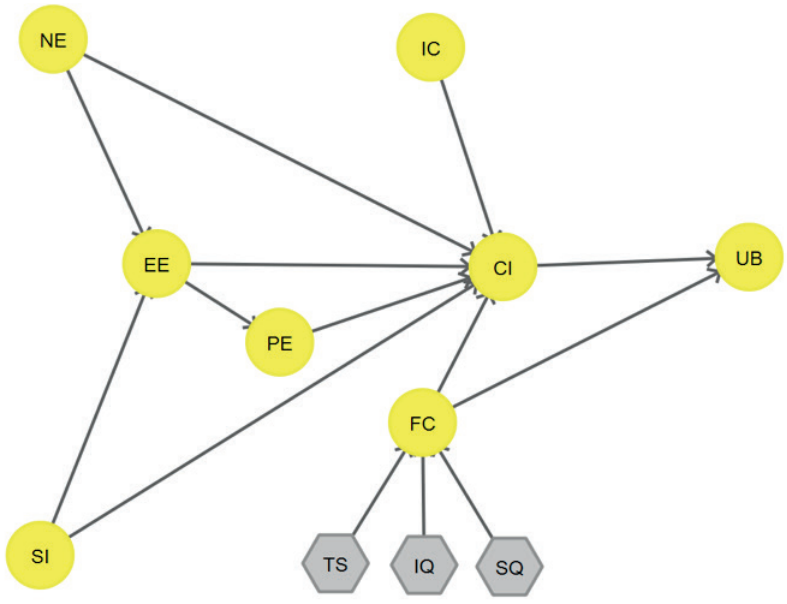

Figure 2. Structural Model
Source: Simulation output

As shown in Table 7, the path coefficients' estimates are placed across the estimate column. The larger the path coefficient estimate, the stronger the impact on the dependent variables is (Hwang, Cho, et al., 2023) Data show that the variable CI has the highest impact on UB (0.80, SE=0.038, 95% CI= [0.70, 0.85]), and the relationship is significant (95% confidence interval does not contain zero.) The variable EE has the second highest impact on PE (0.59, SE=0.49, 95% CI= [0.493, 0.68]) and the relationship is significant (95% confidence interval does not contain zero.) The variable SI also has the third highest effect on EE (0.557, SE=0.063, 95% CI= [0.427, 0.674]), and the variable EE has the fourth highest impact on CI (0.54, SE=0.077, 95% CI= [0.387, 0.683]); both the relationships are significant because the 95% confidence interval does not contain any zeros. Among the fourteen hypothesized paths, three hypothesized paths are statistically insignificant cause 95% of the CIs contain zeros. The impact of the components: TS, IQ, and SQ on FC is also significant. Among the components, SQ (0.269, SE=0.085, 95% CI= [0.118, 0.434]) and IQ (0.27, SE=0.077, 95% CI= [0.113, 0.42]) together have the highest impact on FC. The component TS has a significant impact on FC (0.139, SE=0.061, 95% CI= [0.083, 0.259]). All the components have positive significant relationships because the 95% confidence interval does not contain zero. FC (-0.124, SE=0.047, 95% CI= [-0.215, -0.026] has an insignificant relationship on CI because the 95% confidence interval contains zero. PE (0.139, SE=0.072, 95% CI= [-0.005, 0.273]) also has an insignificant relationship on CI because the 95% confidence interval contains zero. SI (0.03, SE=0.083, 95% CI= [-0.136, 0.19] has an insignificant relationship with EE because the 95% confidence interval contains zero.

Additional Metrics for Model Assessment in the IGSCA

Table 8. Additional estimates for the model assessments

	Cronbach's α	Rho	AVE	R2
Network Externality (NE)	0.864	0.882	0.657	
Effort Expectancy (EE)	0.867	0.875	0.586	0.451
Social Influence (SI)	0.646	0.732	0.493	
Performance Expectancy (PE)	0.797	0.816	0.53	0.359
Interactivity and Control (IC)	0.870	0.877	0.59	
Continuance Intention (CI)	0.896	0.899	0.64	0.665
Use Behavior (UB)	0.782	0.796	0.496	0.78
Facilitating Condition (FC)	0.764	0.777	0.539	0.274

	Dimensionality	PVE
Technical Support (TS)	1	0.584
Information Quality (IQ)	1	0.563
System Quality (SQ)	1	0.715

HTMT

IVs	DVs	Estimate	SE	95% CI	VIF	Effect size (f2)
CI	UB	0.875	0.029	0.787	1.073	1.822
FC	UB	0.443	0.062	0.279	1.073	0.047
FC	CI	0.269	0.057	0.102	1.439	0.016
IC	CI	0.588	0.055	0.408	2.194	0.031
NE	CI	0.593	0.05	0.448	1.525	0.026
EE	CI	0.775	0.043	0.634	1.958	0.411
PE	CI	0.639	0.044	0.514	2.303	0.02
SI	CI	0.729	0.049	0.599	2.758	0.001
NE	EE	0.513	0.055	0.34	1.339	0.037
SI	EE	0.790	0.044	0.657	1.339	0.449
EE	PE	0.634	0.049	0.5		0.559
TS	FC	0.384	0.061	0.227		0.03
IQ	FC	0.578	0.051	0.417		0.078
SQ	FC	0.538	0.052	0.377		0.078

Source: Survey result

As shown in the above table, 45% of the variance in EE is shared by NE and SI. In addition, 35% of the variance in PE is shared by EE. However, 66% of the variance in CI is shared by IC, NE, PE, SI, and FC. Furthermore, 78% of the variance in UB is shared by CI and FC. Finally, a 27% variance in FC is shared by the three components: TS, IQ, and SQ.

A reliability test was conducted for reflective indicators. As shown in Table 8, Cronbach's α and ρc values of the reflective indicators are above 0.70 but less than 0.95 (Hwang, Cho, et al., 2023). Thus, it can be concluded that the scales used in the study are reliable. Also, convergent validity was tested considering AVE (Average Variance Extracted), and the values are all above 0.50 (Hwang, Sarstedt, et al., 2023).

To assess the measurement model that involves components, the researcher investigated the composite indicators' dimensionality. The researcher found that each of the components has a dimensionality value of one, and the PVE (Proportion of Variance) value of SQ is greater than 0.7, but the values of TS and IQ are slightly below the cutoff point. (Hwang, Sarstedt, et al., 2023). The researcher wanted to know if there were multicollinearity issues in the dataset. The analysis shows that all the VIF values are smaller than 3 (Hwang, Cho, et al., 2023). This indicates that multicollinearity is not an issue in the dataset.

The effect size of the independent factor on the dependent factor was checked using $f2$. The effect sizes range from small for the effect of FC on UB (0.04), IC on CI (0.031), NE on CI (0.026), EE on CI (0.411), NE on EE (0.037) to large for the effect of EE on CI (0.411), CI on UB (1.822), SI on EE (0.559), EE on PE (0.559) (Hwang, Sarstedt, et al., 2023).

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

The research model comprising hypotheses was tested using a structural equation modeling tool. The study proved and refuted several relationships, which were consistent and inconsistent with the findings highlighted in the literature. In a developing country, users' continuance intention to use e-learning in the post-pandemic is impacted by several factors: IC, NE, NE via EE, EE, and SI via EE. The study established the direct impact of IC on CI to use e-learning, which is inconsistent with the findings shared by Kishabale (2019) in which the author confirmed a significant relationship of IC on continuance intention to use e-learning via learners' satisfaction. However, in a study in which Martinez-Torres et al., (2008) confirmed the significant relationship between IC and perceived usefulness. NE has a significant direct impact on users' continuance intention to use e-learning, which is consistent with the findings contributed by Y. Lee (2006) and Cheng (2014b). NE also has an indirect impact on CI via EE, which is also similar to the study conducted by Y. Lee (2006). EE has a direct impact on CI to use e-learning in Bangladesh. Furthermore, EE also has a significant impact on PE, but PE failed to have an impact on CI. The findings of the study are similar to the study conducted by Mehta, Morris, Swinnerton, & Homer. (2019).

In addition, SI has an insignificant impact on CI, which is inconsistent with the findings shared by Maisha & Shetu (2023) and Tarhini et al.,(2017). However, SI has a significant impact on EE and an indirect impact on CI via EE. In the literature, the impact of FC on CI and UB has been well-documented (G. Zacharis & Nikolopoulou, 2022). In this study, FC has a significant impact on UB, but FC did not significantly impact CI. The study identified CI as the strongest predictor of UB. UB is influenced by both the CI and FC and accounts for 78% of the variance in UB.

However, the three components: TS, IQ, and SQ accounted for 27% of the variance in FC, thus collectively making a significant impact on FC. The component TS is reflected by three composite indicators. IQ is reflected by four composite indicators, and SQ is reflected by three composite indicators. The weights of the composite indicators are close; therefore, they represent the respective components. The variable FC is the aggregation of the three components: TS, IQ, and SQ.

Furthermore, 35% of the variance in EE is shared by NE and SI; the remaining 74% of the variance is shared by other factors that are not shown in the study. NE has a significant positive impact on EE; likewise, SI also has a significant positive impact on EE. The two variables combined accounted for almost half of the variance in EE. Therefore, it can be predicted that the variables NE and SI can be called the antecedents of the factor EE, which also have significant positive impacts on CI and PE.

In the early 90s, knowledge used to be imparted using different technologies, e.g., the internet, extranet, satellite broadcast, audio/video tape, interactive TV, CD, or DVR. With the emergence of electronic learning, the notion of e-learning turned into a more robust and versatile one (Hassanzadeh et al., 2012). The phenomenon gave birth to many institutions providing electronic education globally. What was disputed once is now well-accepted by the majority. The increasing number of programs offered online makes the notion more accessible to learners. Learners continuously reap benefits from it.

The role of e-learning in imparting knowledge during the pandemic was vital. The process of disseminating knowledge was highly supported by e-learning platforms introduced by the government and initiatives put forward by the HEIs and regulatory bodies. The emergence of the notion was well accepted by the community, making them resilient, and eventually provoked several reactive measures, such as setting up support centers, modernizing infrastructure, educating facilitators, partnering with vendors, etc. The pandemic taught the HEIs how to operate education in times of uncertainty. The actors: educators, learners, regulatory bodies, and technologies formed a value network ensuring personalized and rich learning. In addition, learners showed a positive attitude toward the new notion and became accustomed to it.

The transition was much smoother because of the prior knowledge in dealing with e-learning tools. An elevated level of self-esteem, together with social influence, aided them in dealing with the technicalities with minimal or zero intervention. Learners' interaction with the tool was found to be clear and understandable, stimulating self-paced learning. The adoption rate was even noticeable when the country's internet service providers (ISPs) provided speedy internet. The compatibility issues were minimized by the devices available in the market. The country's vibrant digital wallet industry plays a major role in dealing with issues related to financing services. Combined efforts enforced the widespread adoption of e-learning tools and platforms, making the notion a part of the knowledge-imparting mechanism at the tertiary level. However, the transition was well managed by large universities, but not by small universities. Some users are reluctant to continue with e-learning due to the lack of policies to uphold the usage that they experienced during the pandemic, resulting in discontinuity in usage. Lastly, ongoing investment in technology and infrastructure, continuous innovation in pedagogy, interactive support service, and collaboration between HEIs and industry partners are mandatory to empower remote education. It is expected that, based on the lessons learned from the pandemic, the country's HEIs will be spearheaded to harness the power of e-learning toward establishing a sustainable, cutting-edge, and inclusive education system.

The following are the policies this study may put forward to augment continuance intention to embrace e-learning in Bangladesh:

1. HEIs should acquire or develop an industry-standard LMS to ensure the quality and clarity of educational content, as these tools are developed by professionals for professionals and have widespread features and functionality to support teaching and learning.
2. HEIs should provide industry-standard content creation platforms attuned to the needs of educators and learners to provide personalized learning experiences.
3. HEIs should facilitate self-directed and micro-learning opportunities crafted to the needs of learners.
4. The educators should be provided with additional technical resources and training facilities to increase self-esteem.
5. HEIs should set up one-stop centers for taking care of the mental health and well-being of both the learners and educators.
6. HEIs should provide digital devices and connectivity at reduced cost to ensure communication.
7. HEIs should arrange training, workshops, and symposiums to enrich the technical knowledge of the users with recent advancements.
8. Technology support and a help desk can be provided to assist users in solving technical issues round the clock.
9. Collaboration and communication with international organizations, governments, and NGOs can be nurtured in shaping the online education agenda.
10. Establishing a partnership between HEIs and the technology provided can unlock opportunities to ease e-learning technicalities.

11. Setting up technological infrastructure, including internet bandwidth, hardware, and software to facilitate e-learning.
12. Usage of interactive content should be encouraged by the education expert for inclusion in the lesson.
13. Institutional policy and strategic planning should be attuned to facilitate e-learning usage.
14. HEIs can impose incentives in several categories, encouraging educators to include e-learning tools and techniques.
15. Professional development opportunities should be provided to the educators in the form of training and higher studies, fostering e-learning usage.
16. HEIs should practice or nurture an innovative culture within the organization to teach and learn online.
17. E-newsletters or other means of communication can be enriched with information covering global and local e-learning usage information and the latest advancements.
18. HEIs should encourage opinion leaders, i.e., influencers, celebrities, and philanthropists, to promote the use of e-learning tools and techniques in academia.
19. Government or private organizations may arrange training on non-technical aspects, such as legal, regulatory, advisory, and governance, to foster the use of e-learning in HEIs.
20. Aligning organizational policies with stakeholders' perspectives and expectations is essential to ensuring the successful adoption and effective utilization of e-learning.

The research is centered on some selected dimensions and factors highlighted in the literature. The survey excluded university colleges (e.g., degree colleges under national universities) and open universities. The study is centered on the post-COVID era, excluding the pre-pandemic and pandemic phases. The study examined the continuance intention to accept a variety of educational technologies from users' perspectives, including educators and learners, without exploring the viewpoints of other stakeholders, such as vendors, developers, and support service personnel. The researchers prioritized the survey approach in obtaining the study, excluding the approaches of a qualitative and mixed study. The data collection phase was limited to one month. In addition, the study did not examine the benefits and challenges of EdTech in the post-pandemic era. All the suggested policies and recommendations are applicable and suitable only for the tertiary level, and findings may not be generalizable beyond the educational context of developing countries, such as Bangladesh.

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