Factors impacting acceptance of e-learning in India: learners' perspective

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Abstract

Purpose – This study aims to identify the most significant factors that influence acceptance of e-learning in India. As e-learning has gained popularity in the wake of the COVID-19 pandemic and continues to be one of the most sustainable methods of education, it is pertinent to examine learners' perception towards its acceptance. There is limited literature available on this subject in India, especially factoring in impact of the pandemic.

Design/methodology/approach – This study empirically analyses data of 331 adult e-learners in India, who have enrolled for one of the following e-learning formats: higher education, private coaching, test preparation, re-skilling and online certifications, corporate training and hobby and language-related learning. Their perception is examined on the basis of a model developed using the Unified Theory of Acceptance and Use of Technology model. Data are analysed through structural equation modelling using SPSS and AMOS statistical tools.

Findings – The result of the study shows that Infrastructure Dependability, Effectiveness of Design and Content of Courses and Student's Competency with Computers are the top three factors impacting e-learning acceptance in India.

Research limitations/implications – This study makes several theoretical contributions. Additionally, research findings and recommendations will facilitate education providers, corporates in the education industry and policymakers to focus on the significant areas for enhancing the acceptance of e-learning.

Originality/value – This study identifies and confirms important factors that influence e-learning acceptance and suggests opportunities for further in-depth research and analysis.

Keywords Acceptance of e-learning, Factors influencing acceptance of e-learning, Factors impacting acceptance of e-learning, e-Learning acceptance, Acceptance of online learning

Paper type Research paper

1. Introduction

Education is a US$6 tn industry worldwide, as per Barclays Research and HolonIQ, an education intelligence provider. It is expected to grow to $7.3 tn by 2025 and to $10 tn by 2030 (Barclays and HolonIQ, 2020). The segment of the education industry enabled by technology is called "education technology" or "EdTech" (Barclays and HolonIQ, 2020).

Technology enables various services and solutions across levels in the education space. It encompasses learning, teaching, assessment, credentialing and certification, student data management and research management (HolonIQ, 2021). However, only 3.1% of the total education expenditure worldwide is currently on digital aspects, which is expected to grow to 5.5% by the year 2025 (HolonIQ, 2020). HolonIQ also estimates EdTech to become a US $404 Bn market by 2025 from US$183 bn in 2019 worldwide (HolonIQ, 2020).

As of 2020, education in India is a US$117 Bn market with 360 Mn learners (PGA Labs, 2020). It is expected to grow 2x to US$225 Bn by 2025 (PGA Labs, 2020). The adoption of

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technology has been on a consistent rise in India's education sector in the last 10 years (KPMG, 2017). Inc42 DataLabs estimated the Indian EdTech market to reach US$2.8 Bn in 2020. Aided by strong COVID-19 tailwinds, the report estimates its growth to be US$10.4 Bn by 2025 (Inc42 Data Labs, 2020).

Online learning or e-learning is the largest segment of EdTech, attracting its maximum paid customers (Nasscom, 2018). E-learning refers to learning provided via electronic means. It enables the availability of the learning process and educational curriculum outside the traditional classrooms (HolonIQ, 2021). E-learning offers many benefits such as convenience, saving of time and costs, timely updates, flexibility and easy monitoring of learners' progress. Further, the online learning audience is vast and varied, ranging from school children to retired or working professionals (KPMG, 2017).

E-learning promotes self-education, and with the availability of small and smart schools, it works well. Students are not restricted to gain knowledge within their domestic boundaries; they can now attend sessions across the nation with the help of the Internet. E-learning ensures many benefits such as the following: (1) Irrespective of the distance, it ensures communication between the parties with the help of a dialogues room, digital classroom and emails. (2) 24-h availability of the resources leads to no fixed time frame as teachers are available even after working hours. (3) Even after personal responsibilities, as per the time availability, everyone can learn (Abed, 2019).

There is a change in sense of equality as well; earlier in traditional classrooms, it was observed that weak students hesitated in asking questions and did not share their opinions, but in e-learning, they have a platform where they can send their queries via email and can discuss one-to-one as well (Sharp, 2000). Education is the basic and very strong beam behind the success of any nation (Baiyere and Li, 2016). After COVID-19, the education sector suffered a lot because of the closing and suspension of schools. The sudden suspension left no choice for the education industry and made it vulnerable too. In these times, teachers and educators started trying and using various e-platforms to educate everyone. In this situation, information and communication technology offered edge over the traditional methods with e-learning and virtual universities (Alsoud and Harasis, 2021). COVID-19 created a crisis in the education system and left it with a number of challenges. Challenge of one-to-one education, challenge of virtual education and many more challenges were faced by the world (Edelhauser and Lupu-Dima, 2020).

The e-learning space in India hit an inflection point as the COVID-19 pandemic set in during H1 of 2020 (Inc42 Data Labs, 2020). The pandemic compelled educational institutes and learners to use e-learning for continuing education. In this prevailing situation, it becomes more important to understand the perception of learners towards acceptance of e-learning and evaluate factors that can influence its acceptance positively. There is limited literature on this topic, especially research that (1) factors in the impact of the pandemic and (2) is greater in audience scope and includes adult learners.

Therefore, there is a need to identify the significant factors that affect the acceptance of e-learning systems and consequentially prioritise their effectiveness to improve the overall e-learning outcomes. In India, there are a few research papers on similar topics, especially on e-learning carried out by universities, but it is necessary to increase the scope to include other adult learners and thus support the success of the e-learning ecosystem. This study aims to evaluate factors that affect acceptance of e-learning and is targeted to users in the higher education space, test preparers over the age of 20 years, working professionals investing in re-skilling and online certifications and corporate training and users over the age of 20 years for hobby and language-related learning.

To summarise, the main objectives of this research are to (1) identify the impact of factors that influence the acceptance of e-learning systems in India for adult learners and (2) suggest ways to improve students' e-learning acceptance in India. This paper is structured as follows:

Section 2 introduces the concepts and covers the extant literature, Section 3 has the research model and lays the hypothesis, Section 4 covers the research method, Section 5 provides the results of this research, Section 6 shares the discussion and Section 7 provides conclusions.

2. Relevant studies

This section examines the meaning of e-learning and past studies on the subject. It also explores the factors that affect the acceptance of e-learning. Based on these findings, a research model and hypotheses are developed in Section 3.

2.1 E-learning

E-learning is a training or learning procedure that is created, managed and delivered using different information technology (IT) tools which can be local or global (Masie, 2016). E-learning is defined as a learning methodology that is dependent on Internet communications and facilitates interaction between students and lecturers through suitably designed content and resources (Resta and Patru, 2010).

Along the lines of Nguyen *et al.* (2014), this research takes e-learning to be a learning method based on the Internet that is conducted through a formal educational program and is managed by a learning management system (LMS). It is meant to ensure collaboration and interaction and thus satisfy the learning demands of any learners irrespective of time and place. Pham and Huynh (2017) noted that there is a difference in e-learning in developed and developing countries. In developing countries like India, e-learning has been applied in the recent few years and proper technology infrastructure to support education is still underway.

The outbreak of COVID-19 has emphasised the change in learning from traditional teaching to online teaching. Now, most schools and universities have provided a hybrid system of teaching so that those who can't come to school because of physical disabilities can now attend schools and higher education. In many governments of foreign countries like Georgia, the Education Ministry of Georgia has provided Microsoft Teams to all the public schools and also started TV schools (The Government of Georgia, 2020).

2.2 Past studies on e-learning

The National Center for Education Statistics has reported an increment in the requirement for e-learning due to the COVID-19 pandemic. As per Biswas *et al.* (2020), there has been a surge in the research on understanding students' perceptions and expectations of e-learning. Studies also reveal that learners' perceptions and acceptance are affected by a number of factors.

However, there are very limited studies that focus on the factors affecting acceptance of e-learning in India during the COVID-19 timeframe, especially the ones that cover adult learners, i.e., learners over the age of 18 years.

2.3 Factors affecting acceptance of e-learning

E-learning is essentially an information system; thus, the acceptance of e-learning can be measured just like the acceptance of any other information system or technology. Acceptance of a technology system can also be factored as the success of that system, and thus, this study will consider all factors that contribute to the acceptance or success of a technology system.

According to Seddon (1997), there are three aspects that evaluate an information system's success. These are (1) quality of a system as measured by timeliness, relevance and accuracy; (2) perceptual measurements such as user satisfaction and perceived usefulness and (3) perceived benefits that can range from organisational to individual to social.

DeLone and McLean (2003) added service quality as an additional contributing factor of the information system success model to the above-listed factors.

Pham and Huynh (2017) measured the success of an e-learning system through independent variables covering perceived usefulness, computer self-efficacy, email interaction, face-to-face interaction, ease of use and social presence.

There are two more models that can be used to understand the acceptance of a technology system: Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). Davis *et al.* (1989) developed the TAM using Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA). The TAM explains that there are two main factors affecting the acceptance of information systems: perceived easiness in use and perceived usefulness. This was further explained by Venkatesh and Davis (2000) who suggested the Technology Acceptance Model (TAM2), an extension to explore the determinants of perceived easiness of use and perceived usefulness.

Venkatesh *et al.* (2003) proposed the UTAUT to reason the factors affecting user behaviour towards acceptance of information systems. The UTAUT proposes that four factors affect acceptance: effort expectancy, performance expectancy, facilitating conditions and social influence. Venkatesh *et al.* (2012) developed UTAUT2 by adding three new factors to these four: exchange value, convenience and habit.

Over the years, the UTAUT has been used as the foundational theory to explore the acceptance attributes of e-learning. Incorporating the context of e-learning systems, the UTAUT focuses on the following four factors:

2.3.1 Performance expectancy. Acceptance of e-learning is influenced by the design and content of the courses and the collaboration of students, as per Laily *et al.* (2013) and Selim (2007). These could be considered as the two factors within performance expectancy.

2.3.2 Effort expectancy. This factor can be interpreted as the ease of use of e-learning systems by e-learners. As per Laily *et al.* (2013), the computer competency of students affects acceptance of e-learning systems.

2.3.3 Social influence. As per Selim (2007), lecturers/teachers play an important role in the acceptance of e-learning as they are in the capacity of advising students, implementing tests, organising events online and engaging students. This is representative of the factor of social influence.

2.3.4 Facilitating conditions. Conditions such as dependable infrastructure, platform/provider/university support and accessibility of Internet affect e-learning, as per Selim (2007). These crucial factors can be considered as facilitating conditions for e-learning acceptance.

3. Research model and hypotheses

3.1 Research model

On the basis of the discussion mentioned earlier, the UTAUT model is selected as the foundational theory for this study as the UTAUT covers a majority of factors that affect the acceptance of e-learning. The UTAUT is the "unified theory of acceptance and use of technology" model that was formulated by Venkatesh *et al.* in "User acceptance of information technology: Toward a unified view" (2003). This model aims to explain a user's intentions and dependencies to use an information system and the ensuing usage behaviour. It is based on four key constructs, first being performance expectancy, second effort expectancy, third social influence and fourth facilitating conditions (see Figure 1).

For the proposed research model, seven constructs, being directly based on these 4 dimensions of the UTAUT model, are drawn in this study. The seven defined constructs are as follows: Effectiveness of Instructor or Lecturer, Student's Competency with Computers, Student's Collaboration Interests, Effectiveness of Design and Content of Courses, Accessibility of Essential Resources, Infrastructure Dependability and Provider Support Received.

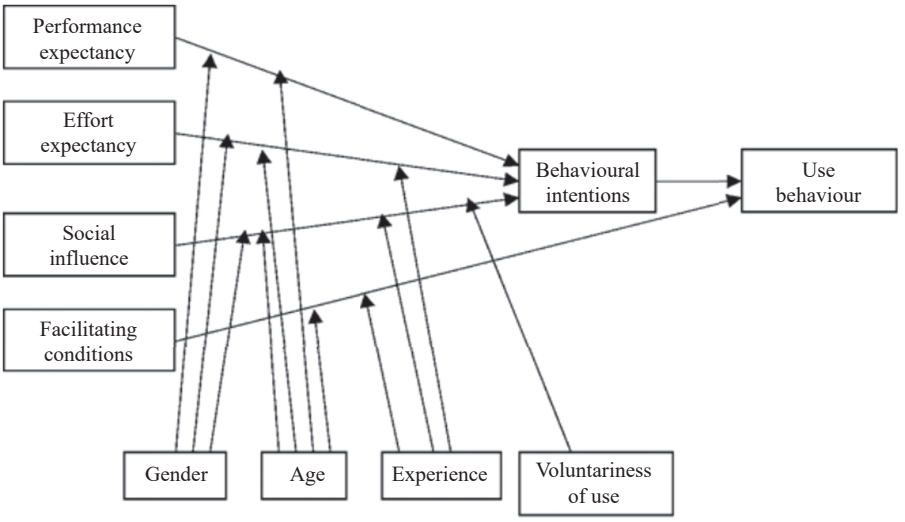

Figure 1.
The UTAUT model, adapted from Venkatesh *et al.* (2003)

It can be observed, as mentioned in Section 2, that constructs "Student's Collaboration Interests" and "Effectiveness of Design and Content of Courses" can be associated to performance expectancy; construct "Student's Competency with Computers" is related to effort expectancy; "Effectiveness of Instructor or Lecturer" is associated to social influence and "Accessibility of Essential Resources", "Infrastructure Dependability" and "Provider Support Received" tie into facilitating conditions (see Figure 2).

3.2 Hypothesis statements

The seven hypothesis statements are developed from the seven factors obtained through the review and analysis so far.

3.2.1 Instructor. Being a student-centred method, collaboration, evaluation and interaction in e-learning are critical. As per Harasim *et al.* (1995), e-learning contributes to increased

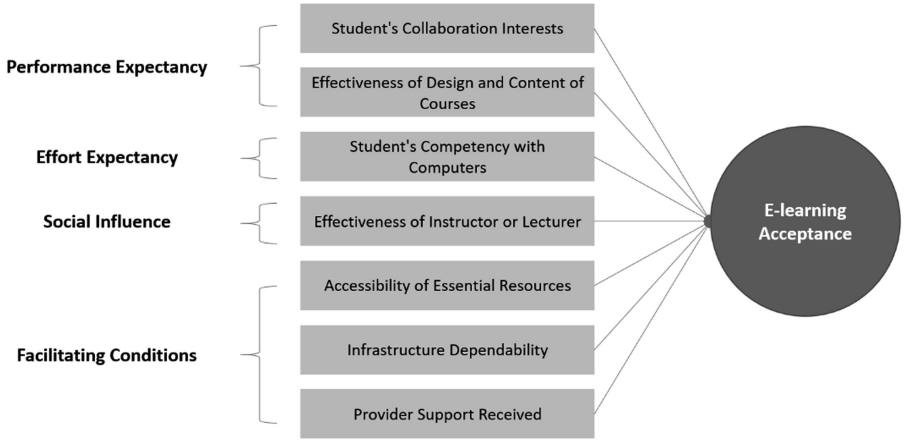

Figure 2.
The proposed research model

student–teacher interaction as compared to traditional teaching methods. Owston (1997) also stated that students are able to let go of the fear of participating in classes in a virtual module. Further, an instructor can play a vital role in motivating students to use online learning systems as well as have an impact on their e-learning acceptance, as per Selim (2007). Therefore, the following hypothesis is proposed:

H1. There is a significant impact of the instructor on e-learning acceptance of students.

3.2.2 Computer competency. Proficiency of students in using computers has a positive influence on their e-learning acceptance, according to Soong *et al.* (2001). Similarly, Selim (2007) too stated that prior experience in using computers and overall computer competency contribute to e-learning acceptance. Laily *et al.* (2013) further confirmed the likelihood of increased e-learning acceptance amongst students with higher computer competency. Hence, the hypothesis can be stated as follows:

H2. There is a significant impact of computer competency on e-learning acceptance of students.

3.2.3 Collaboration interests. The opportunity to collaborate and interact increases the acceptance amongst students for e-learning. According to Selim (2007), collaboration amongst learners helped in increasing the acceptance of e-learning. Laily *et al.* (2013) also demonstrated the positive influence of collaboration on e-learning acceptance. Therefore, the hypothesis can be stated as follows:

H3. There is a significant impact of collaboration of students on the e-learning acceptance of students.

3.2.4 Design and content of courses. This refers to the learners' perception about the updates to the content, richness and vastness of content and the structure of the overall course. Selim (2007) and Laily *et al.* (2013) showed that there is a positive influence of design and content of courses towards the acceptance of e-learning amongst students. Therefore, the hypothesis is as follows:

H4. There is a significant impact of content and design of the courses on the e-learning acceptance of students.

3.2.5 Accessibility of essential resources. Accessibility of essential resources refers to the ease of students in obtaining/accessing resources for e-learning. Selim (2007) noted that easy access to resources necessary for online learning contributed to increased acceptance amongst students. These resources include connection to the Internet, bandwidth connectivity, browsing speed, etc. Hence, the hypothesis is as follows:

H5. There is a significant impact of accessibility of essential resources on the e-learning acceptance of students.

3.2.6 Infrastructure dependability. According to Selim (2007), the reliability of core infrastructure requisite for online learning facilitation was an influential factor in acceptance of the e-learning system. Laily *et al.* (2013) confirmed that infrastructure is a contributing factor too. Infrastructure includes devices (computer, laptop, tablet, etc.) and communications network. Therefore, the hypothesis is as follows:

H6. There is a significant impact of infrastructure dependability on the e-learning acceptance of students.

3.2.7 Platform/provider/institution support. For e-learning, the courses are mostly facilitated by a provider or platform such as certification websites or learning platforms. In the case of higher education and corporate training, the university or institution facilitates this.

Govindasamy (2001) and Benigno and Trentin (2000) defined this support as a success factor in the acceptance of e-learning. Selim (2007) also realised that similar support from university or institution like technical facilitation and coordination, library e-access, etc. contributes to increased acceptance. Baleghi-Zadeh *et al.* (2017) further established the positive influence of technology support on LMS acceptance through the perceived easiness of use. Therefore, the hypothesis is as follows:

H7. There is a significant impact of platform/provider support on the e-learning acceptance of students.

4. Method

4.1 Methodology

Using the research model suggested earlier, a structured questionnaire was created with close-ended questions. The following steps were carried out thereafter:

Step 1: Preliminary Quantitative Research. The first version of the questionnaire was circulated to 40 participants who had prior experience with e-learning. These data were collected, and reliability was tested using Cronbach's alpha test and exploratory factor analysis. On the basis of the discrepancies observed in this set, minor modifications were made to the survey questionnaire. The final survey was then circulated to students and working professionals to capture responses.

Step 2: Final Quantitative Research. The final questionnaire was sent to students at higher education institutes and to the professionals across different age groups, domains and industries. The only requirement was that the survey participant must have undertaken an e-learning course in the last one year. The data collected were analysed through Cronbach's alpha analysis, exploratory factor analysis, confirmatory factor analysis (CFA) and structural equation modelling (SEM).

4.2 Measurement scales

A 5-point Likert scale was used to solicit responses from the participants to gather their inputs to each variable. The variables rolled up to 8 constructs – 7 were factors impacting e-learning acceptance, and the 8th construct gauged the acceptance of e-learning by participants. The first construct, Effectiveness of Instructor, had 6 variables developed from Soong *et al.* (2001) and Volery and Lord (2000). The second construct, Student's Competency with Computers, drew 5 variables from Soong *et al.* (2001). The third construct, Student's Collaboration Interests, had 5 variables again from Soong *et al.* (2001). The fourth construct, Effectiveness of Design and Content of Courses, had 5 scales from Soong *et al.* (2001). The fifth construct, Accessibility of Essential Resources, had 6 items from Volery and Lord (2000). The sixth construct, Infrastructure Dependability, developed 4 items from Volery and Lord (2000). The seventh construct, Provider Support Received, had 6 items based on Selim (2007). The eight construct, What Do You Feel About E-Learning, measured e-learning acceptance and was developed on 7 items from Selim (2007) and Nehari and Bender (1978).

Here are the variables used for each construct (see Table 1).

4.3 Data gathering and analysis

According to the research by Hoang and Chu (2008), the minimum sample size for analysis of data must be higher than 5 times the observed variables. In this study, 44 variables were observed, developed from 8 underlying factors. Thus, the minimum sample size requirement was 220 (44×5). In order to get sufficient data, the survey was shared with over 1,000 participants and the aim was to collect about 300 responses.

Construct	Items	Scale adaptation
1. Effectiveness of Instructor	(1) Enthusiasm of instructor (2) Instructor's style of presentation holds interest of students (3) Instructor actively interacts (4) Students are invited to ask questions and receive answers (5) Students are invited to participate in class discussion (6) Instructor encourages use of e-learning	Soong *et al.* (2001), Volery and Lord (2000)
2. Student's Competency with Computers	(1) Enjoyment in the use of computer/tablet/phone (2) Regular use of computer/tablet/phone (3) Ease in use of computer/tablet/phone (4) Prior experience in use of computer/tablet/phone (5) Not intimidated by the use of technology for education	Soong *et al.* (2001)
3. Student's Collaboration Interests	(1) Participation in group discussions (2) Participation includes reading messages on discussion groups (3) Participation includes reading as well as contributing to discussion groups (4) Instructor initiates discussion (5) Students initiate discussions	Soong *et al.* (2001)
4. Effectiveness of Design and Content of Courses	(1) Learning material is sufficient and relevant (2) E-learning platform is easy to use (3) E-learning platform is easy to navigate (4) Course material is current and up to date (5) User interface is well designed	Soong *et al.* (2001)
5. Accessibility of Essential Resources	(1) Easy access to Internet (2) No bandwidth problems when browsing (3) Satisfactory browsing speed (4) Ease of interaction with fellow students (5) Ease of contacting instructor (6) Easy-to-use e-learning website	Volery and Lord (2000)
6. Infrastructure Dependability	(1) Computer/tablet/phone works fine and supports most of the required applications (2) No access issues with email id, browser, etc. (3) Stable and secure Internet connection (4) Efficient IT infrastructure	Volery and Lord (2000)
7. Provider Support Received	(1) Easy access to resources provided by platform/provider/institute (2) Ease of receiving technical support (3) Provider support for e-learning system is good (4) Sufficient material provided for associated exam (5) Sufficient material provided for learning purpose (6) Appropriate duration of the course	Selim (2007)
8. What Do You Feel About E-Learning	(1) E-learning is successful (2) E-learning is an effective method of learning (3) Likeness towards the idea of using e-learning (4) Online education considered constructive and as a helpful learning experience (5) Awareness of e-learning platforms pre-COVID (6) Improved perception towards e-learning due to COVID (7) Intention to continue e-learning post-COVID	Selim (2007), Nehari and Bender (1978)

Table 1.
Scale adaptation variables used in the constructs

5. Results and observations

After the data were collected, it was analysed with the help of Cronbach's alpha analysis, exploratory factor analysis, CFA and SEM. To this effect, the statistical tools IBM SPSS and IBM SPSS AMOS were used.

5.1 Overview of data collected

Data for this research were collected through the random sampling method. The survey questionnaire was circulated via email, social networking websites and university forums and in person also. A total of 388 responses were received from the survey. Out of these, there were 331 valid responses. Invalid responses comprised of respondents who had not taken any e-learning course, who gave the same answer to every question, etc.

The following is a demographic overview of the data received ($N = 331$) (see Table 2).

5.2 Cronbach's alpha analysis

Cronbach's alpha measures the reliability of a set of data. It determines the internal consistency by checking how closely items are related to a construct. A scale can be considered reliable if its Cronbach's alpha coefficient (α) is greater than 0.6. Also, as Nguyen and Nguyen (2011) defined, the item correlation within a group must be greater than 0.3 and if it is not so, the item must be removed.

On analysing the results from this survey, it was found that the Cronbach's alpha of all constructs was greater than 0.6. However, there were 4 items that had to be removed owing to correlations lesser than 0.3. Here is a summary (see Table 3).

Demographics	Percentage (%)
Age	
20–25 years	26%
26–30 years	39%
31–35 years	20%
36–40 years	7%
41–45 years	4%
46–50 years	2%
50+ years	2%
Gender	
Male	72%
Female	28%
E-learning undertaken in the last one year	
Re-skilling and online certifications	71%
Corporate training	39%
Higher education	28%
Hobby classes	16%
Talk series, short learning webinars	33%
Test preparation	20%
Preferred e-learning mode	
Mobile phone	8%
Laptop/tablet	67%
Mobile phone and laptop/tablet equally	25%

Table 2. Demographic data of survey participants

Factors	Naming convention used for analysis	Alpha	Item-total correlation	Number of items removed	Items removed
Effectiveness of Instructor	ELI	0.897	0.441–0.785	0/6	
Student's Competency with Computers	SCC	0.868	0.456–0.728	0/5	
Student's Collaboration Interests	SCI	0.840	0.535–0.832	2/5	SCI2 and SCI4
Effectiveness of Design and Content of Courses	ECD	0.856	0.490–0.700	0/5	
Accessibility of Essential Resources	AER	0.845	0.314–0.804	1/6	AER5
Infrastructure Dependability	ID	0.896	0.573–0.840	0/4	
Provider Support Received	PSR	0.918	0.519–0.834	0/6	
What Do You Feel About E-Learning	Outcome	0.929	0.553–0.823	1/7	Outcome 5

Table 3.
Cronbach's alpha analysis results

5.3 Exploratory factor analysis

Exploratory factor analysis is a multivariate technique that is used to identify underlying relationships between a set of data variables. The first step within this is the Kaiser–Meyer–Olkin (KMO) and Bartlett test, which indicates the suitability of data for purposes of structure detection. The KMO coefficient in these data was 0.930, indicating that exploratory factor analysis could be used since the coefficient was >0.5.

It showed that hypothesis of correlation within the variables must be rejected as Sig. = 0.000. Further, with Eigenvalue ≥ 1, with the "principal component analysis" method, using "Promax" rotation along with Kaiser normalisation, there were 7 factors extracted from the 40 measured variables. There were no variables with low loading (<0.3) factor coefficients, and thus, no variables had to be removed at this stage. This output could be used next for CFA (see Figures 3 and 4).

5.4 Confirmatory factor analysis

In multivariate statistics, CFA is used to assess the fitment between observed variables and an *a priori* identified theoretical model. This analysis helps in checking the model fit. There are metrics that are calculated to determine the goodness of fit. For purpose of this study, the following are considered to check for the model fit:

(1) CMIN – Chi-square

(2) CMIN/df – Chi-square/degree of freedom

(3) GFI – Goodness of fit index

(4) CFI – Comparative fit index

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.930
Bartlett's Test of Sphericity	Approx. Chi-Square	10242.353
	df	780
	Sig.	0.000

Figure 3.
KMO and Barlett's test result

Pattern Matrix[a]

	Component						
	1	2	3	4	5	6	7
ELI1	0.011	0.147	0.760	–0.056	0.032	0.105	–0.146
ELI2	0.016	0.140	0.752	–0.182	0.043	0.155	–0.086
ELI3	–0.122	–0.056	0.848	0.045	0.039	–0.013	0.079
ELI4	–0.020	–0.076	0.830	0.058	–0.029	–0.095	0.072
ELI5	0.024	–0.121	0.875	0.014	–0.036	–0.096	0.092
ELI6	–0.063	0.099	0.784	0.098	–0.068	–0.025	–0.004
SCC1	–0.016	0.225	–0.003	–0.084	0.761	–0.023	0.011
SCC2	0.044	–0.054	–0.024	–0.031	0.865	0.001	0.102
SCC3	0.066	–0.093	0.045	–0.031	0.838	0.072	–0.033
SCC4	–0.049	0.073	0.023	0.002	0.831	–0.059	0.009
SCC5	–0.038	–0.089	–0.077	0.192	0.746	–0.084	0.027
SCI1	0.001	–0.010	0.123	–0.001	0.053	0.006	0.829
SCI3	0.027	–0.060	0.115	–0.048	0.067	0.036	0.848
SCI5	–0.137	0.180	–0.130	–0.010	0.025	0.101	0.798
ECD1	–0.036	0.194	–0.100	0.004	–0.078	0.732	0.103
ECD2	0.149	–0.140	0.021	–0.119	0.034	0.875	0.025
ECD3	0.065	–0.154	0.011	0.003	0.045	0.858	–0.045
ECD4	–0.084	0.106	–0.007	0.110	–0.099	0.716	0.101
ECD5	–0.109	–0.007	0.009	0.216	–0.030	0.737	–0.005
AER1	0.771	–0.101	–0.004	–0.033	0.167	0.044	0.034
AER2	0.900	0.042	–0.067	–0.117	–0.081	0.061	0.036
AER3	0.955	0.021	–0.038	–0.054	–0.046	–0.065	0.008
AER4	0.437	–0.059	0.176	0.120	–0.153	–0.084	0.386
AER6	0.438	0.126	0.203	0.094	0.078	0.130	–0.109
ID1	0.618	–0.013	0.027	0.110	0.200	–0.015	–0.076
ID2	0.550	–0.061	–0.085	0.178	0.107	0.084	–0.057
ID3	0.927	0.049	–0.039	0.025	–0.071	–0.030	–0.024
ID4	0.891	0.087	–0.006	–0.011	–0.066	–0.039	–0.028
PSR1	0.172	0.109	–0.002	0.569	0.055	0.069	0.051
PSR2	0.002	–0.038	–0.074	0.803	0.033	–0.053	0.160
PSR3	0.047	0.083	–0.015	0.791	–0.004	–0.008	0.042
PSR4	–0.051	–0.086	0.072	0.893	0.024	–0.064	–0.085
PSR5	–0.008	–0.042	0.086	0.881	–0.021	0.037	–0.085
PSR6	–0.038	0.226	–0.074	0.731	0.021	0.053	–0.092
Outcome1	–0.002	0.873	–0.10	–0.007	0.049	0.028	0.007
Outcome2	0.064	0.892	–0.057	0.007	0.008	–0.034	0.013
Outcome3	–0.005	0.910	0.051	–0.090	0.067	0.030	–0.021
Outcome4	0.092	0.885	–0.035	–0.058	–0.047	–0.029	0.059
Outcome6	–0.048	0.758	0.048	0.150	–0.136	–0.094	0.057
Outcome7	–0.008	0.745	0.053	0.056	0.089	–0.008	–0.003

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Figure 4.
Exploratory factor analysis result

(5) TLI – Tucker–Lewis Index

(6) RMSEA – Root mean square error approximation

According to Nguyen (2013), for a model to be considered fit as per market data, the values of TLI, GFI and CFI must be ≥ 0.9, RMSEA ≤ 0.08 and CMIN/df ≤ 3.

Initially as the estimates are calculated, TLI = 0.861, GFI = 0.758, CFI = 0.872, RMSEA = 0.073 and CMIN/df = 2.771, which clearly did not meet the criteria. In the next iterations, variables are removed one by one based on variables with low weights as per the standardized regression weights table. In this order, the following variables were removed: AER4, AER6, Outcome 6, SCC1, Outcome 7, ELI2, Outcome 3, ID3, ELI1, ELI6, AER2, PSR1, PSR2, PSR6 and ECD1. Finally, the following values were estimated: CMIN = 430.083, CMIN/df = 1.741, GFI = 0.905, CFI = 0.965, TLI = 0.958 and RMSEA = 0.047.

This determined that the model could be fit to the survey data. The final CFA result, as created in AMOS software, was as follows (see Figure 5).

5.5 Structural equation model analysis

SEM is a multivariate statistical technique that is used to determine structural relationships between latent constructs and measured variables. SEM analysis is based on CFA. As the determined model was fit for survey data, the next step here was to build the structural relationship between the variables.

Here is the finalised SEM result, as presented in AMOS (see Figure 6).

Analysing the text output of this diagram, the following values are noted that are to be used to accept/reject the hypothesis of this study.

The *P*-value is considered to be a piece of evidence against the null hypothesis, and a *p*-value less than 0.05 (ideally ≤ 0.05) is statistically significant, leading to the null hypothesis being rejected. To that effect, only one hypothesis from the observed 7 is rejected (H07-PSR, rest 6 are accepted) (see Table 4).

6. Discussion

This analysis showed that Infrastructure Dependability (0.217), the Effectiveness of Design and Content of Courses (0.159), Student's Competency with Computers (0.059), Student's Collaboration Interests (0.057) and Effectiveness of Instructor (0.008) had a significant impact on the e-learning acceptance of students, in that order. Accessibility of essential resources (−0.035) had insignificant impact on e-learning acceptance. Provider/platform/university technical support has no impact on the acceptance of e-learning by students.

These results are quite similar to prior research by Selim (2007) and Laily *et al.* (2013) which had the collaboration of students, course content and IT infrastructure as the top three impact factors. However, in this study, two of these factors are the same, and collaboration of students is the differentiating factor as this study has student's competency with computers instead. From the research by Pham and Huynh (2018), competency with computers, social presence and student collaboration was drawn as the top three factors. Again, computer competency is common in the top three factors in the current study.

E-learning in India is still at a nascent stage, and the results of this study can be explained in that context. Infrastructure dependability refers to the core technology (computer/laptop) and communications network (Internet connectivity) required for e-learning to function. Many parts of India have undependable Internet connectivity, and poor networks now and then are common in most areas of the country. Thus, dependable infrastructure is the first and foremost requirement for e-learning acceptance. Secondly, the quality and learning outcome of e-learning is driven by the content of the courses offered and the way that they are

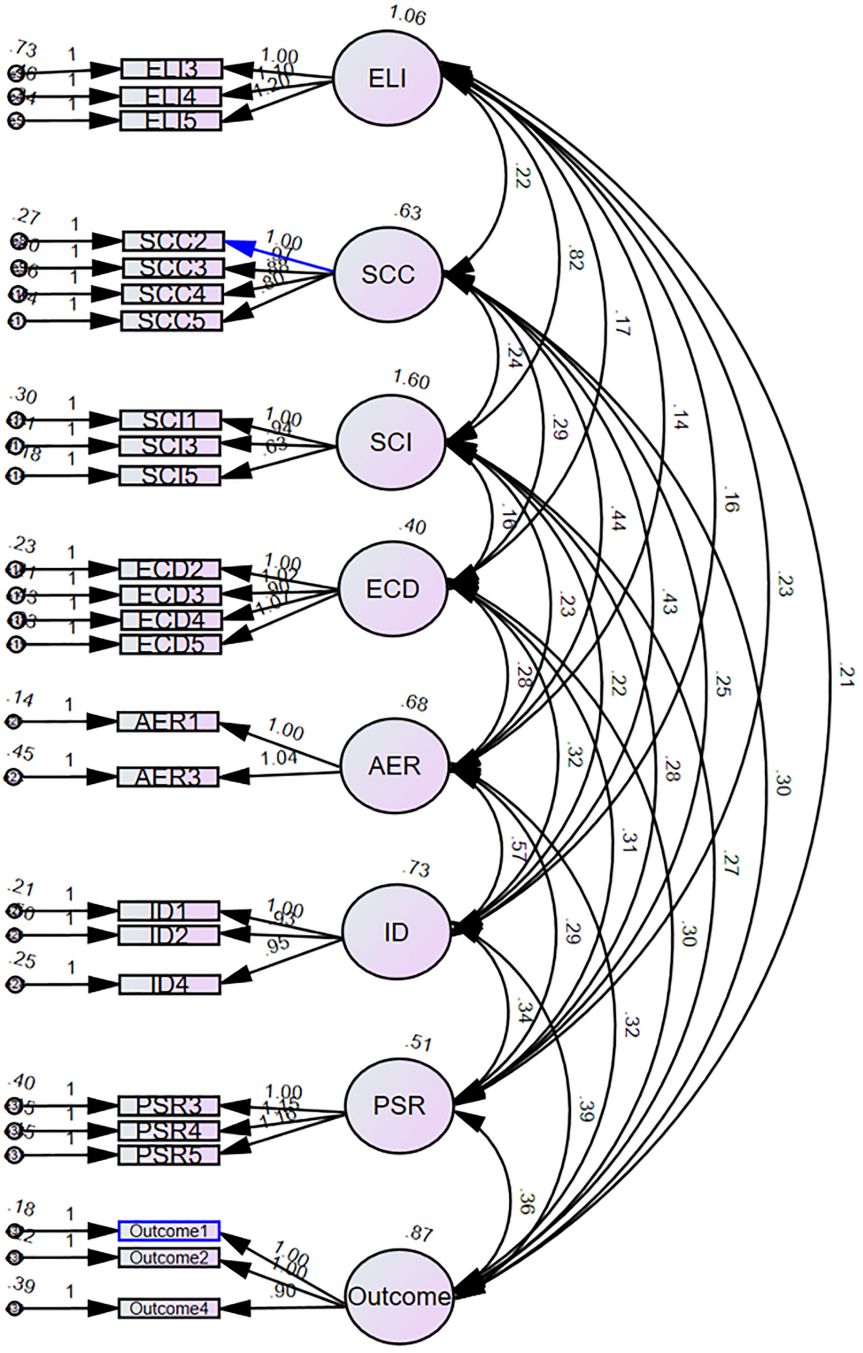

Figure 5.
Final standardised CFA result

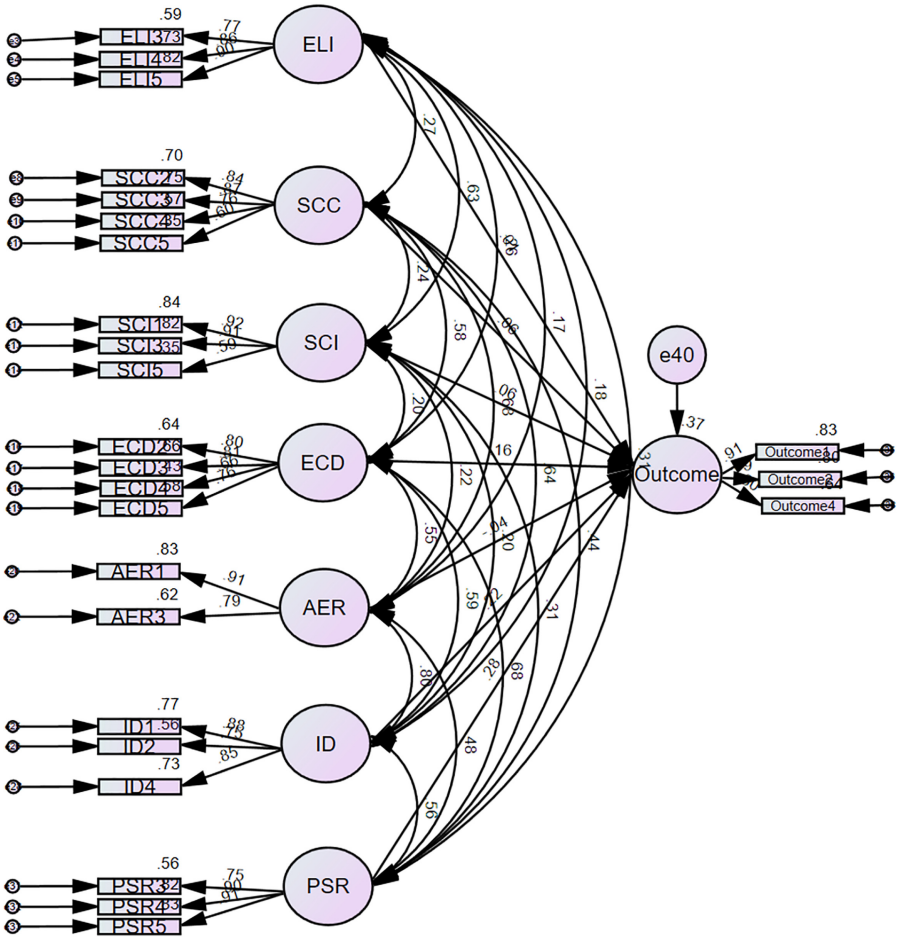

Figure 6.
Final standardised structural equation model analysis result

Code	Hypothesis statement	Standardised weight	*P*-value	Result
H1	Outcome ← ELI	0.008	0.909	Not rejected
H2	Outcome ← SCC	0.059	0.482	Not rejected
H3	Outcome ← SCI	0.057	0.416	Not rejected
H4	Outcome ← ECD	0.159	0.079	Not rejected
H5	Outcome ← AER	-0.035	0.756	Not rejected
H6	Outcome ← ID	0.217	0.053	Not rejected
H7	Outcome ← PSR	0.285	***	Rejected

Table 4.
Hypothesis testing results

designed. Perceived good-quality content and user-friendly structuring tend to lead to higher acceptance of e-learning. Thirdly, as noted in the earlier part of the study, a vast majority of e-learning is currently driven by re-skilling and certification courses. EdTech in India has been popularised only in the last 8–10 years; thus, this re-skilling and certification learning

audience is mid/late technology adopters and not digital natives. Their competency in using computers is workable and might not be extremely proficient. This explains why computer competency criteria rank in the top third.

Moving to the other two criteria, students' collaboration interests rank very close to the computer competency criteria. Students enjoy collaborating with instructors and peers over online learning, and this enhances their acceptability of the e-learning format. This coalesces with the proven fact that students have lesser inhibitions or fears when participating online vs participating in traditional formats. The last factor, the effectiveness of the instructor, points to the collaboration encouraged by the facilitator by asking questions, involving students in discussions and encouraging acceptance of e-learning. This factor ranking last could be majorly attributed to the fact that most of the e-learning designed in India presently is in recorded formats vs being live teaching. The majority of re-skilling and certification courses are pre-recorded and leave hardly any room for live discussions. The test preparation category and higher education tend to have live interactions with teachers, but the quantum of this category in overall e-learning is low.

Accessibility of essential resources has an insignificant impact on e-learning acceptance. These resources include good connectivity, satisfactory browsing speed, no bandwidth problems when browsing, easy-to-use e-learning websites, etc. These can be understood as convenience factors as opposed to necessity factors. In India, the first technology requirement is core hardware and software and a dependable network (infrastructure dependability factor), and convenience comes as secondary or not a priority. This explains why accessibility falls in the insignificant impact category.

Lastly, provider/platform/university technical support has no impact on the acceptance of e-learning by students. This factor is not at all influencing in e-learning acceptance as it is least expected/required by students. E-learning acceptance is not dependent on this criterion at all.

7. Conclusion

7.1 Conclusions

This study has reviewed past literature on the acceptance of e-learning and created a model to test the factors affecting acceptance of e-learning in India. The model used in this study was based on the UTAUT model and comprised of 7 factors covering 44 variables developed from past research.

Data were collected to understand users' behaviours regarding e-learning acceptance. From a total of 388 responses received, 331 could be analysed for the study. The data analysis was conducted with the help of Cronbach analysis, exploratory factor analysis, CFA and SEM. This was carried out with the help of tools like SPSS and AMOS.

The results of the study showed that infrastructure dependability, effectiveness of design and content of courses and students' competency with computers were the top three factors impacting e-learning acceptance in India. Students' collaboration interests and effectiveness of instructor also had a significant impact on the e-learning acceptance of Indian students.

7.2 Recommendations

As Infrastructure Dependability, Effectiveness of Design and Content of Courses and Student's Competency with Computers are the top three factors impacting e-learning acceptance, the primary focus must be on these criteria to increase the acceptance. This can be done in the following ways:

(1) *Infrastructure Dependability*. On a micro-level, different organisations can take active steps to improve the infrastructure required by their e-learners. For example, for

online corporate training, companies can ensure that their employees have well-functioning laptops and proper network connectivity. In case of higher education, universities can provide laptops/tablets or other devices to students as part of the onboarding resources. Further, Shuja *et al.* (2019) showed that mobile platforms contribute to students' improved academic performance. This insight can be utilised by test preparation organisations and other institutes to ensure that their e-learning content is mobile-friendly.

(2) *Effectiveness of Design and Content of Courses*. Learning online is different from learning in traditional formats and requires understanding behaviours and drivers of learners. To that effect, design and content of e-courses must be updated and revised regularly. E-learning content must also be broken into smaller pieces, infused with more effective methods like videos, whiteboarding and live interactions and structured in easily consumable ways. More innovative techniques like gamification can also be introduced to improve content design effectiveness.

(3) *Student's Competency with Computers*. Platforms, organisations and institutes can equip students with learning resources to improve their computer competency. They can provide the option to learn both basic and advanced computer features and skills. One example to do this could be to include a 5-min optional introduction to a new user upon enrolling in a platform. Another example could be a short virtual training to higher education students during on-boarding procedures.

The next two factors, though not most critical, can be improvised in the following ways:

(1) *Student's Collaboration Interests*. Different online activities and games can be included in course content to have students interact and collaborate more. Virtual workshops can encourage group participation and presentation. An information portal or collaboration tool such as Microsoft Teams or Google Meet can be provided to students for effective participation. These activities can be scored and measured for enhanced effect.

(2) *Effectiveness of Instructor*. An instructor can improve effectiveness by involving students more in classes. Instructors can encourage students to speak and participate, ask questions, conduct activities, etc. They can also improvise on the format and structure of classes to change from simply sharing presentations online to include videos, app-based games, quick quizzes, etc.

These recommendations are indicative and not exhaustive; however, their implementation can help in improving the acceptance of e-learning.

7.3 Contributions

This study makes several theoretical contributions to academia. It adds new and current dimensions to previous research on the subject, including the impact on COVID-19. The findings discovered herein can be used as premises for further research.

Additionally, this study brings out results for industry use. Research findings and recommendations covered herein will facilitate education providers, corporates in the education industry and policymakers to focus on the significant areas for enhancing the acceptance of e-learning in India.

7.4 Limitations and future research

There are a few limitations of this study, enumerated as hereunder: (1) The sample size of 331 is small and limited. (2) The data sample might be limited to urbanised populations and might

not reflect the acceptance factors in rural areas or students belonging to very-low- or very-high-income groups. (3) The seven factors included for consideration in the study might not be exhaustive, and there could be potential factors (more current or innovative) not included in the study.

Thus, as with all research, there is scope for further work from this study. The small size can be expanded to allow for wider coverage of geographical area, even beyond India, or to rural populations, within India. It would be helpful to introduce other potentially impacting variables to this research for further findings. Further, each of the top impacting factors can be explored in greater detail to find potential areas of the highest impact.

References

Abed, E.K. (2019), "Electronic learning and its benefits in education", *EURASIA Journal of Mathematics, Science and Technology Education*, Vol. 15 No. 3, em1672.

Alsoud, A.R. and Harasis, A.A. (2021), "The impact of covid-19 pandemic on student's e-learning experience in Jordan", *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 16 No. 5, pp. 1404-1414.

Baiyere, A. and Li, H. (2016), "Application of a virtual collaborative environment in a teaching case", in *AMCIS 2016: Surfing the IT Innovation Wave - 22nd Americas Conference on Information Systems*.

Baleghi-Zadeh, S., Ayub, A.F.M., Mahmud, R. and Daud, S.M. (2017), "The influence of system interactivity and technical support on learning management system utilization", *Knowledge Management and E-Learning*, Vol. 9 No. 1, pp. 50-68.

Barclays and HolonIQ (2020), "Education technology: out with the old school", available at: https://www.investmentbank.barclays.com/our-insights/education-technology-out-with-the-old-school.html (accessed 15 May 2021).

Benigno, V. and Trentin, G. (2000), "The evaluation of online courses", *Journal of Computer Assisted Learning*, Vol. 16 No. 3, pp. 259-270.

Biswas, K., Asaduzzaman, T.M., Evans, D., Fehrler, S., Ramachandran, D. and Sabarwal, S. (2020), *TV-Based Learning in Bangladesh: Is it Reaching Students?* World Bank, Washington, DC, https://openknowledge.worldbank.org/handle/10986/34138.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *ManagementScience*, Vol. 35 No. 8, pp. 982-1003.

DeLone, W.H. and McLean, E.R. (2003), "The DeLone and McLean model of information systems success: a ten-year update", *Journal of Management Information Systems*, Vol. 19 No. 4, pp. 9-30.

Edelhauser, E. and Lupu-Dima, L. (2020), "Is Romania prepared for eLearning during the COVID-19 pandemic?", *Sustainability*, Vol. 12 No. 13, p. 5438.

Fishbein, M. and Ajzen, I. (1975), *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*, Addison-Wesley Publishing Company, Reading, MA.

Govindasamy, T. (2001), "Successful implementation of e-learning: pedagogical considerations", *The Internet and Higher Education*, Vol. 4 Nos 3-4, pp. 287-299.

Harasim, L., Hiltz, S.R., Teles, L. and Turoff, M. (1995), *Learning Networks: A Field Guide to Teaching and Learning Online*, The MIT Press, Cambridge, MA.

Hoang, T. and Chu, N.M.N. (2008), "Phân tích dữ liệu nghiên cứu với SPSS (tập 1 & 2)", *HCMC: NXB. Hồng Đức*.

HolonIQ (2020), "Global EdTech market to reach $404B by 2025-16.3% CAGR", available at: https://www.holoniq.com/notes/global-education-technology-market-to-reach-404b-by-2025/ (accessed 15 May 2021).

HolonIQ (2021), "2021 global learning landscape", available at: https://www.globallearninglandscape.org/ (accessed 16 May 2021).

Inc42 Data Labs (2020), "The future of education: Indian startups chase $10 Bn Edtech opportunity", available at: https://inc42.com/datalab/the-future-of-education-indian-startups-chase-10-bn-edtech-market/ (accessed 16 May 2021).

KPMG (2017), "Online education in India: 2021", available at: https://assets.kpmg/content/dam/kpmg/in/pdf/2017/05/Online-Education-in-India-2021.pdf (accessed 16 May 2021).

Laily, N., Kurniawati, A. and Puspita, I.A. (2013), "Critical success factor for e-learning implementation InstitutTeknologi Telkom bandung using structural equation modeling", in *Paper presented at the International Conference on Information and Communication Technology*, Bandung, Indonesia, 20–22 March 2013.

Masie, E. (2016), "E-learning definition of Masie Elliot learning center", available at: https://www.elearninglearning.com/masie/ (accessed 16 May 2021).

MES (2020), "Ministry of education, science, culture and sport of Georgia. 'Ministry of education, science, culture and sport of georgiato strengthen distance learning methods'", available at: https://www.mes.gov.ge/content.php?id=10271&lang=eng (accessed 16 June 2020).

Nasscom (2018), "EdTech – the advent of digital education", available at: https://nasscom.in/knowledge-center/publications/edtech-advent-digital-education (accessed 16 May 2021).

Nehari, M. and Bender, H. (1978), "Meaningfulness of a learning experience: a measure for educational outcomes in higher education", *Higher Education*, Vol. 7 No. 1, pp. 1-11.

Nguyen, D.T. (2013), "Phương pháp nghiên cứu khoa học trong kinh doanh", *HCMC: NXB. Tài Chính*.

Nguyen, D.T. and Nguyen, T.M.T. (2011), "Nghiên cứu khoa học Marketing: Ứng dụng mô hình cấu trúc tuyến tính SEM", *HCMC: NXB. Lao Động*.

Nguyen, T.D., Nguyen, T.M., Pham, Q.T. and Misra, S. (2014), "Acceptance and use of e-learning based on cloud computing: the role of consumer innovativeness", *Lecture Notes in Computer Science*, No. 8583, pp. 159-174.

Owston, R.D. (1997), "Research news and comment: the world wide web: a Technology to enhance teaching and learning", *Educational Researcher*, Vol. 26 No. 2, pp. 27-33.

PGA Labs (2020), "The great 'un-lockdown': Indian EdTech – disruptions and opportunities for the next decade", available at: https://www.praxisga.com/PraxisgaImages/ReportImg/pga-labs-ivca-report-the-great-un-lockdown-indian-edtech-Report-3.pdf (accessed 16 May 2021).

Pham, Q. T. and Huynh, M. C. (2017), "Impact factor on learning achievement and knowledge transfer of students through e-learning system at Bach Khoa University, Vietnam", *Proceedings of the International Conference on Computing Networking and Informatics (ICCNI)*, IEEE, doi: .https://doi.org/10.5585/iji.v6i3.235.

Pham, Q.T. and Huynh, M.C. (2018), "Learning achievement and knowledge transfer: the impact factor of e-learning system at Bach Khoa University, Vietnam", *International Journal of Innovation*, Vol. 6 No. 3, pp. 194-206.

Resta, P. and Patru, M. (2010), *Teacher Development in an E-Learning Age: A Policy and Planning Guide*, UNESCO, Paris.

Seddon, P.B. (1997), "A respecification and extension of the DeLone and McLean model of IS success", *Information Systems Research*, Vol. 8 No. 3, pp. 240-253.

Selim, H.M. (2007), "Critical success factors for e-learning acceptance: confirmatory factor models", *Computers and Education*, Vol. 49 No. 2, pp. 396-413.

Sharp, S. (2000), "Internet usage in education for technology horizon in education", Vol. 27 No. 10, pp. 12-14.

Shuja, A., Qureshi, I.A., Schaeffer, D.M. and Zareen, M. (2019), "Effect of m-learning on students' academic performance mediated by facilitation discourse and flexibility", *Knowledge Management and E-Learning*, Vol. 11 No. 2, pp. 158-200.

Soong, B.M.H., Chan, H.C., Chua, B.C. and Loh, K.F. (2001), "Critical success factors for online course resources", *Computers and Education*, Vol. 36 No. 2, pp. 101-120.

Venkatesh, V. and Davis, F.D. (2000), "A theoretical extension of the technology acceptance model: four longitudinal field studies", *ManagementScience*, Vol. 46 No. 2, pp. 186-204.

Venkatesh, V., Moms, M.G., Davis, G.B. and Davis, F.D. (2003), "User acceptance of information technology: toward a unified view", *MISQuarterly*, Vol. 27 No. 3, pp. 425-478.

Venkatesh, V., Thong, J.Y.L. and Xu, X. (2012), "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology", *MIS Quarterly*, Vol. 36 No. 1, pp. 157-178.

Volery, T. and Lord, D. (2000), "Critical success factors in online education", *The International Journal of Educational Management*, Vol. 14 No. 5, pp. 216-223.

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