



Transitioning to online learning in higher education: Influence of Awareness of COVID-19 and Self-Efficacy on Perceived Net Benefits and Intention

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Abstract

The COVID-19 pandemic has disrupted existing educational systems worldwide. Due to lockdowns in several countries, the educational institutions have been directed by governments to move towards online learning. The challenge for educational institutions and faculty members is to assess the influence of various factors that would enable adoption of online learning by students in higher education. This study investigates the influence of awareness of COVID-19 (AOC19), computer & internet self-efficacy (CISE), and online communication self-efficacy (OCSE) on perceived net benefits (NB) of the students and their intention towards the online learning (INT). The study further analyzes the mediating role of students' attitude towards online learning (ATOL). Data of 1023 students of higher education across multiple universities in India were collected and analyzed using structural equation modelling through AMOS 24 and mediation analysis through 'PROCESS' macro for SPSS. The findings revealed that, AOC19 positively influenced students' NB and INT; CISE had a significant inverse relationship with NB, and partially significant positive relationship with INT; OCSE was observed to be a significant predictor of NB with positive direct relationship; ATOL had a significant full mediation among CISE and NB, and acted as significant partial mediator between CISE and INT, AOC19 and NB, AOC19 and INT, OCSE and NB, and OCSE and INT. This paper would be useful for the faculty members, institutions and education technology companies in the higher education domain by enabling an understanding of the attitude, perception and intention of the students towards online learning during the COVID-19 scenario.

Keywords Online Learning · Higher Education · Perceived net benefits · Attitude · Intention · COVID-19

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1 Introduction

Technology has enabled the adoption of electronic learning and online learning systems increasingly over the past couple of decades as an important component of knowledge delivery in several universities across the world (Lin et al., 2013). Richardson and Swan (2003) defined online learning as “any class that offers its entire curriculum in the online course delivery mode, thereby allowing students to participate regardless of geographic location, independent of time and place”. The outbreak of the novel coronavirus pandemic (COVID-19) as a public health phenomenon has caused drastic changes in the way education is being imparted across the world. The pandemic resulted in a world-wide lockdown in many countries and to ensure the social distancing, all educational institutions in India stopped classroom teaching. Nonetheless, to continue the education process, the apex education regulatory bodies in India – the University Grants Commission (UGC) and the All-India Council for Technical Education (AICTE) advised colleges and universities to move towards online learning modes of education (Sreehari, 2020). Both faculty members and students are facing significant challenges in adapting to the online learning environment. (Adarkwah, 2020; Almaiah et al., 2020). Many countries are contemplating the continuance of the online learning mode in the near future in order to maintain social distancing (Mo et al., 2021). In light of the possible continuance of online learning mode, it is important for educational institutions to investigate the factors that would influence the adoption of online learning by students with a positive mindset.

Researchers have examined the online learning through various lenses such as identification of key factors, technology adoption, assessment of issues with respect to online learning systems, and student and faculty satisfaction with online learning (Buchanan et al., 2013; Caliskan et al., 2017; Liu et al., 2010; Rajabalee & Santally, 2020). However, an assessment of the impact that factors such as the awareness of the COVID-19 pandemic, computer & internet self-efficacy as well as online communication self-efficacy on the perceived net benefits that would accrue to students, intention of the students to adopt online learning systems and the mediating role of attitude has not received due attention. Given the current pandemic situation, a study of the factors which would impact the adoption of online learning by students in higher education has a practical orientation from the perspective of students, faculty members, institutions and education technology companies.

The following research questions emerged from a review of the extant literature and were sought to be addressed through this study.

1. Does an awareness of the COVID-19 pandemic impact students’ perception of net benefits from online learning and their intention to adopt online learning?
2. Do students’ Computer & Internet Self-efficacy and Online Communication Self-efficacy influence their perception of net benefits from online learning and their intention to adopt online learning?

3. Does Attitude play a mediating role in the relationships between the awareness of the COVID-19 pandemic, the self-efficacies of the students on one hand and their perception of net benefits and intention to adopt online learning on the other?

This study makes four significant contributions to the academic body of knowledge in the field of online learning. The first contribution is in the form of exploring how the exogenous construct of ‘Awareness of COVID-19’ (AOC19) can have an impact on the ‘Perceived Net Benefits’ (NB) accruing from adopting an online learning format by students and also influence their ‘Intention towards online learning’ (INT). The second contribution is assessment of the impact of additional exogenous constructs in the form of two types of self-efficacy viz., ‘Computer & internet self-efficacy’ (CISE) and ‘Online communication self-efficacy’ (OCSE) on NB as well as the students’ INT in higher education. The third contribution pertains to the perusal of ‘Attitude towards online learning’ (ATOL) as a mediating variable between the three exogenous constructs mentioned above and the endogenous constructs of NB and INT. The construct of NB has typically been examined from a perspective of benefits that accrue to the various stakeholders in an organization from the adoption of a technology-based system (Bhuasiri et al., 2012; DeLone & McLean, 2003; Hassanzadeh et al., 2012; Zhang & Thompson, 2019). Our fourth contribution by way of this study is the examination of the construct NB in an online learning in a higher education environment which in our view has been examined only in relatively fewer studies (Salam & Farooq, 2020).

This paper is further structured as follows. Section 2 outlines the theoretical framework used as the basis for the conceptualization of the study, followed by review of relevant literature of the key constructs and hypotheses proposed in this study in the Sect. 3. Further, Sect. 4 addresses the research methodology adopted for the study while Sect. 5 details the statistical analysis and results. Subsequently, discussion based on the results is provided in the Sect. 6 while Sect. 7 outlines the theoretical, practical and social implications of the study. The conclusions, limitations and the future research directions have been detailed in Sect. 8.

2 Literature review

2.1 Online learning

Research on online learning in pre-COVID-19 times has indicated mixed results on the efficacy of online learning systems when assessed through various contexts. Means et al. (2013) posit that the performance of e-learners is marginally better than those in traditional face to face learning environments. Mosquera (2017) reported that the virtual learning environment was found to be productive and useful by teachers. Mathew et al. (2019) reported that faculty members faced several impediments such as students being non-responsive during online classes, inability of the teachers to supervise the student learning process and difficulties in teaching online for longer periods of time.

Previous research in the domain of online learning has investigated this field from several perspectives. Volery and Lord (2000) investigated the key success factors required for online education. Abdullah et al. (2016) explored the influence of self-efficacy, subjective norms, enjoyment, computer anxiety and experience on students' perceived ease of use and perceived usefulness. Hung et al. (2010) developed a scale to assess learner readiness which outlined five key dimensions to assess learner readiness in online learning systems – self-directed learning, motivation for learning, online communication self-efficacy, computer/ internet self-efficacy and learner control.

Research on online learning perspectives during the COVID-19 pandemic has focused on the effectiveness of the shift to online learning and teaching systems and the issue of student assessment thereof (Al-Hattami, 2020). Researchers have also examined the critical success factors for online learning during the COVID-19 pandemic (Alqahtani & Rajkhan, 2020), the difficulties in online learning systems (Chang & Fang, 2020) and learners' acceptance of the migration to online learning (Mukhtar et al., 2020).

The domain of higher education is on a transitionary mode and is currently experiencing a period of great change. Given the current situation wherein the shift to online learning systems has been more or less mandated by the ongoing pandemic, an awareness of the dangers of having face to face classes (Munir et al., 2021) and an understanding of the need to move towards an online format of education is imperative. The successful implementation of online learning can translate into benefits for the students, only if they have a favorable attitude towards the online learning format (Salam & Farooq, 2020; Shaft et al., 2004). In addition, their skills pertaining to computer & internet efficacy and online communication efficacy would act as enablers in the entire process (Hung et al., 2010).

2.2 Theoretical framework

This study bases itself on the theoretical foundation offered by the Stimulus-Organism-Response (SOR) model proposed by Mehrabian and Russell (1974). The SOR model proffers that multiple environmental factors can act as stimulus (S) which can influence an individual's external state specified in the model as organism (O) and this can thereafter drive the individual's behavioral response (R). This model therefore comprises of three components – “stimulus/stimuli” – these are considered external to the person which can evoke affective responses reflected through emotions and feelings (Batra & Ray, 1986), “organism” – which encompasses the inner state of the individual's thinking, feelings and perceptions and these affective and cognitive states act as a mediator between the stimulus and the “response” which is essentially the final outcome of the individual's behavior (Moon et al., 2017). Significant research using the SOR model has been carried out in exploring online user behaviors in online shopping and electronic commerce transactions (Kim & Lennon, 2012; Moon et al., 2017). However, very few studies (Zhai et al., 2020) have used this model to examine user behavior in online learning settings.

Previous studies have classified stimuli as being of two types – social and psychological stimuli that originate from the external environment in which an individual exists and object stimuli that comprise of product characteristics and other object attributes (Arora, 1982). In our study, AOC19 is considered to be one such external stimuli, which is of a social and psychological nature. The theoretical foundation is further strengthened with the addition of the Social Cognitive Theory (Bandura, 1977, 1982) which offers a conceptual framework for understanding how self-efficacy of an individual has a significant effect on cognitive and affective processes. Thus, this study uses two measures of self-efficacy – CISE and OCSE as additional environmental stimuli which can trigger a cognitive and affective response in an individual.

The SOR model outlines three emotional states – pleasure, arousal and dominance as represented by “organism” (Mehrabian & Russell, 1974). Prior research on this subject has also extended the internal states of the organism to include other variables such as cognition, value, emotion and affect (Fiore & Kim, 2007; Lee et al., 2011). Previous research studies have operationalized attitude as the “organism” in the SOR model in multiple contexts (Chen & Huang, 2012; Kaur et al., 2017; Lee et al., 2011; Moon et al., 2018; Romero et al., 2021; Suparno, 2020; Vergura et al., 2020). Through this study, we seek to make a significant contribution to the existing body of knowledge on the SOR model by operationalizing attitude as an emotional state represented by “organism” in the model and seeking to assess the impact of external stimuli on the attitude of a student towards online learning.

NB has been proposed as a dependent variable in several studies. Hassan et al (2015) examined the success of information systems in higher education in an e-government context. The study concluded that the usage of the e-government information systems leads to net benefits which indicate the success of the information system. Lwoga (2013) researched the suitability of information systems (IS) success model with respect to the adoption of library 2.0 technologies among undergraduate students in Africa by positing net benefits to the students and users as the final outcome variable. Xinli (2015) examined the impact of using an Electronic Monitoring System on reducing corruption in China. The study concluded that application of such systems has a positive effect on reduction in corruption levels which was construed as a net benefit for organizations and the society at large. Thus, NB is construed as a “response” in the SOR framework used in the study.

Furthermore, the conceptual foundation offered by the SOR model and the Social Cognitive Theory is sought to be augmented by integrating the Theory of Reasoned Action (Ajzen & Fishbein, 1975, 1977) and the Theory of Planned Behavior (Ajzen, 1985). The Theory of Reasoned Action (TRA) posits that an individual’s behavior towards an object is formed by the intention to perform that particular behavior. According to this theory, an individual’s attitudes are determined by the beliefs held by the individual about the consequences of his/ her behavior and also suggests that external stimuli influence attitudes by suitably modifying the structure of the individual’s beliefs (Ajzen, 1985). The TRA framework has been extensively used to predict consumer intentions and behavior (Casselmann & Damhorst, 1991; Gentry & Calantone, 2002). This study uses the TRA framework to assess the impact of the stimuli on an individual’s attitude towards online learning, the net benefits that an

individual perceives from the online learning system and finally, the intention of the individual towards the online learning system. Thus, INT is also envisaged as the “response” in the SOR framework used in the study.

Ajzen (1985) extended the TRA as Theory of Planned Behavior (TPB) by adding one more predictor to the existing TRA model in the form of Perceived Behavioral Control. This predictor accounts for those instances wherein an individual has the intention of carrying out a particular behavior but is restrained from doing so due to lack of confidence or control over such behavior. This construct was referred to by information systems literature as the concept of “self-efficacy”, which has been reflected by the use of the two self-efficacy related constructs of CISE and OCSE in this study.

The Information Systems (IS) model developed by DeLone and McLean (1992, 2003) envisaged the outcomes of an information system as a manifestation of the overall impact that the information system has on an organization. This study proposes to extend DeLone and McLean’s (2003) updated IS model to the online learning environment by envisaging the contributions of an online learning system as its NB.

The use of multiple theoretical frameworks to support constructs used in research has been employed in several studies across various research domains (Alzahrani & Seth, 2021; Dalvi-Esfahani et al., 2020; Farooq et al., 2019; Hausman & Siekpe, 2009; Hung et al., 2010; Liao et al., 2017; Lim & Tai, 2014; Udo et al., 2010; Yusuf et al., 2018; Zhou, 2016; Zahid & Haji Din, 2019).

3 Constructs and hypotheses

3.1 Awareness of COVID-19

The COVID-19 pandemic has emerged as a once-in-a-generation black swan event (Krishnamurthy, 2020; Taleb, 2007). In order to maintain social distancing, educational institutions were directed by governments to transition towards online learning systems. Migrating to an online learning format could offer a more convenient method of continuing the education process in the prevailing pandemic situation (Al-Hattami, 2020). This study has considered “Awareness of COVID-19” (AOC19) as a relevant “stimulus” as the survey for this research was conducted in the early phase of the pandemic wherein people at large were just getting an awareness of the dangers that the pandemic posed. We represent the construct of AOC19 as “an awareness of the benefits of shifting towards an online learning platform and perceiving it as a convenient method of continuing education so as to possibly minimize the chances of contracting COVID-19”.

Previous studies have focused on the difficulties and solutions thereof with respect to online learning (Chang and Fang, 2020), e-assessment of student performance during online learning in COVID-19 pandemic situation (Al-Hattami, 2020), salient factors for online learning during COVID-19 pandemic and transitioning from face-to-face lectures to an online learning environment during the COVID-19 pandemic (Mpungose, 2020). However, there is a need to also understand, whether

AOC19 leads to NB and INT and hence, considering AOC19 as a ‘stimulus’ in the SOR framework, we propose the following hypotheses:

- H1: AOC19 has a significant impact on NB*
H2: AOC19 has a significant impact on INT

3.2 Self-Efficacy in online learning

Self-efficacy is believed to be one of the key factors for successful online learning. It includes a learner’s evaluation of his/her own ability to achieve a goal or the learner’s self-belief to achieve that goal (Yokoyama, 2019). Several research studies have investigated various types of self-efficacy in an online learning system such as technology self-efficacy (Choi et al., 2007), computer self-efficacy (Kim & Park, 2018; Lim et al., 2016), e-learning system self-efficacy (Jashapara & Tai, 2006), academic self-efficacy (Lim et al., 2016), knowledge sharing self-efficacy (Tseng & Kuo, 2010), internet self-efficacy (Chiu & Tsai, 2014), communication-internet self-efficacy (Chu, 2010) and online learning self-efficacy (Hong et al., 2017).

Shen et al., (2013) investigated the various dimensions of self-efficacy through an exploratory factor analysis and the study identified five dimensions of self-efficacy with respect to online learning:

- a. Self-efficacy to complete an online course
- b. Self-efficacy to interact socially with classmates
- c. Self-efficacy to handle tools in a course management system.
- d. Self-efficacy to interact with instructors in an online course.
- e. Self-efficacy to interact with classmates for academic purposes

An extensive review of the literature on self-efficacy in online learning systems indicated that there were two key self-efficacies that were required to successfully navigate an online learning system. These related to the handling of the technology/computer/ tools used in online learning (Dimensions (a) and (c) as outlined by Shen et al., 2013) and the efficacies related to communicating online with other students and faculty members (Dimensions (b), (d), and (e) as outlined by Shen et al., 2013). Hence, CISE and OCSE were the constructs considered and this study has employed the scales suggested by Hung et al, (2010) for these constructs.

3.2.1 Computer & Internet Self-Efficacy

There has been significant research carried out on Self-Efficacy which has been construed to arise from the acquisition of cognitive, social and linguistic skills over a period of time through experience (Bandura, 1982). CISE is the belief of an individual about his/ her ability to use a computer and the internet (Compeau & Higgins, 1995). The idea of self-efficacy also stems from the social cognitive theory which outlines how beliefs about self-efficacy can regulate functioning of individuals (Bandura, 1977). Compeau and Higgins (1995) developed a scale for measuring

computer self-efficacy and posited that computer self-efficacy had a significant influence on emotional responses and actual use of computer-based technologies. Eastin and LaRose (2000) examined the concept of internet self-efficacy and stipulated that it is the ability of an individual to harness internet skills in an online learning environment. Based on the SOR framework and the social cognitive theory, we proffer the following hypotheses:

H3: CISE has a significant impact on NB.

H4: CISE has a significant impact on INT.

3.2.2 Online Communication Self-Efficacy

Another key self-efficacy is that of an individual being able to communicate effectively online. Interaction and communication provide a critical link between teachers and students in online learning environments (McVay, 2000) and these communications may serve to enrich the overall perceived benefits from online learning. Roper (2007) stipulated that the students should aim at using online discussions to learn better as these typically provide opportunities for in-depth delving into the subject. Online discussions also act as a facilitating tool for better engagement between teachers and students. Hung et al. (2010) have developed and validated a scale for measurement of OCSE and observed that students with better OCSE also felt more comfortable in expressing themselves in the written form. Considering OCSE as a ‘stimulus’ in the SOR framework, the following hypotheses are proposed:

H5: OCSE has a significant impact on NB.

H6: OCSE has a significant impact on INT.

3.3 Perceived Net Benefits

The concept of NB refers to the degree to which an information system benefits an individual, group or a firm (Alzahrani et al., 2017). Most studies examining this concept examine the contributions of an information system as its net benefits for the various stakeholders in an organization (Salam & Farooq, 2020). Yet other researchers have opined that the perception of net benefits may vary from user to user and from system to system (Marnewick, 2016). The Information Systems (IS) model developed by DeLone and McLean (1992, 2003) envisaged the outcomes of an information system as a manifestation of the overall impact that the information system has on an organization. DeLone and McLean (2003) in the IS model have postulated that the ultimate parameter of the success of any system is the net benefits that the system generates. While encouraging positive attitudes or mindful usage of the system may be an important concern, the goal of any system should be the net benefits that the system provides. Hence the IS Model posits net benefits as the final dependent variable. Net benefits in the IS model are also influenced by user satisfaction. As satisfaction in the IS model includes items that measure attitude, it has been theorized in the IS model that attitude has a direct effect on net benefits (Jewer

et al., 2017). This study proposes to extend DeLone and McLean's (2003) updated IS model to the online learning environment by envisaging the contributions of an online learning system as its NB. Previous researchers (Anaya, 2013; Kurkalova & Carter, 2017) have opined that the construct of NB has not been explored fully to date and more so in the arena of online education. This study attempts to answer this call for research by conceptualizing NB as an outcome of online learning systems in the higher education domain.

3.4 Intention towards Online Learning

Online learning is gaining prominence in higher education (Abdel-Wahab, 2008) and due to COVID-19, higher educational institutions are required to quickly adapt to online learning environments. Previously, many researchers (de Souza Rodrigues et al., 2021; Sidik & Syafar, 2020; Xu & Wang, 2017) have studied students' intention in the online learning environment and considered it to be a substantial outcome. This study focuses on assessing the association between the exogenous constructs of AOC19, CISE and OCSE on the students' intention towards online learning as a way of education.

3.5 Attitude towards Online Learning

A key component of the individual's intention to adopt an online learning system is the attitude that is formed by the individual based on the stimuli that he/she has been exposed to. An understanding of an individual's attitude can enable the prediction of the individual's overall response to a particular object. and the link between attitude and behavior has been well established in research literature through the Theory of Reasoned Action (Ajzen & Fishbein, 1977). The concept of attitude has typically been examined in research with a view to understanding its mediating relationship between various exogenous constructs and behavioral intentions such as purchase/repurchase/ revisit intentions (Evans & Bang, 2019; Hausman & Siekpe, 2009) or intention to adopt a specific technology (Irani et al., 2013; Wahid, 2007).

Researchers have also examined the role of attitude as a mediating variable in the adoption of online learning systems (Alenezi & Karim, 2010; Ndubisi, 2004; Yasin et al., 2020). Markova and Jones (2011) examined benefits satisfaction as an attitude formed through the beliefs about benefits and the perceived value of these benefits in an organizational environment. However, only a few research studies have focused on the association between attitude and NB. Koh et al., (2010) evaluated a model for mandatory usage of software technologies wherein attitude mediated the relationship between several exogenous constructs (information quality, performance expectancy, social influence and information satisfaction) and usage and overall satisfaction which further led to net benefits. Elmorshidy (2018) examined the impact of knowledge management systems on innovation and posited that attitude as a mediating variable between exogenous constructs and intention leading to usage and thereby and net benefits. Almalki et al., (2013) developed a conceptual framework to evaluate the success of e-Government portals and proposed that attitude would

mediate the relationship between several exogenous constructs (Information quality, System quality, Service quality, Perceived risk, Perceived ease of use, Perceived Usefulness) and Behavioral intention to use the portal which would further influence the usage and perceived net benefits from the portals.

This paper seeks to contribute to academic literature by positing ATOL as a mediating variable in the relationship between the exogenous constructs of AOC19, CISE and OCSE and the endogenous constructs of NB and INT. Based on the above, the following hypotheses are proffered:

- H7: ATOL mediates the association between AOC19 and NB.*
H8: ATOL mediates the association between CISE and NB.
H9: ATOL mediates the association between OCSE and NB.
H10: ATOL mediates the association between AOC19 and INT.
H11: ATOL mediates the association between CISE and INT.
H12: ATOL mediates the association between OCSE and INT.

Based on the above discussion and hypotheses mentioned, this study proposes the following conceptual model: Fig. 1

4 Research methodology

4.1 Construct and measurement development

The proposed model for the study comprised of three exogenous constructs – AOC19, CISE and OCSE, one mediating construct – ATOL and two endogenous constructs – NB and INT. The measures used have been well established in

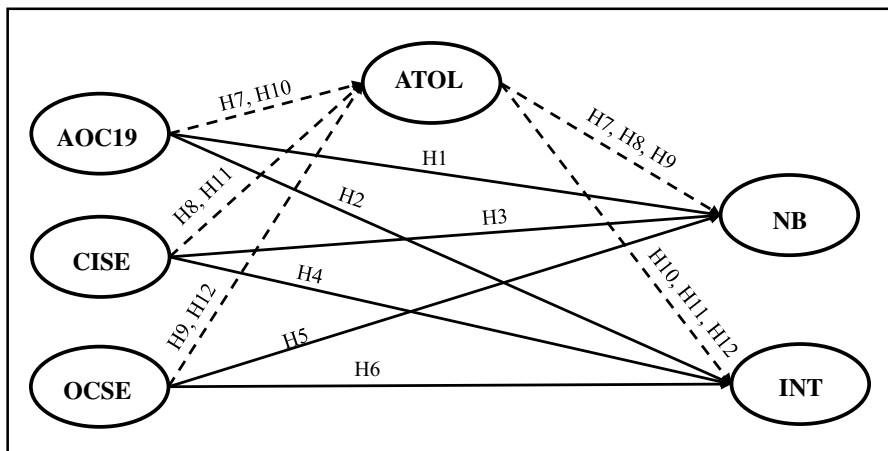


Fig. 1 Proposed Conceptual Model. **Legend:** AOC19: Awareness of COVID-19, CISE: Computer/ Internet Self Efficacy, OCSE: Online Communication Self Efficacy, ATOL: Attitude towards Online Learning, NB: Perceived Net Benefits, INT: Intention towards online learning

prior research literature and care was taken to ensure that only previously validated measures were selected and these were suitably adapted to the online learning context to further enhance their validity. In order to measure AOC19, four items were adapted from a study investigating the effectiveness of the shift to online teaching and learning during the COVID-19 pandemic (Al-Hattami, 2020). CISE and OCSE were measured using three items each which were adapted from Hung et al. (2010). ATOL was measured using four items from Shaft et al. (2004), while NB was measured using five items from Salam and Farooq (2020). To measure the INT, three items were adapted from Ji et al. (2019); Xu and Wang (2017). A total of 22 items were used to measure the six constructs used in this study. All the items were measured on a five-point Likert Scale which measured the agreement/ disagreement of the respondents from “Strongly Disagree” to “Strongly Agree”.

Table 1 synthesizes the items used for the measurement of each of the constructs used in the study along with the sources for the same.

4.2 Sampling and data collection

Sampling is a technique used in research in order to select a representative set of individuals from within a population so as to estimate the characteristics of the population. This study used non-probability based convenience sampling method by reaching out to faculty members who would have ready access to the students of higher education.

Data collection for the study was carried out by sending the questionnaire by email to 214 faculty members across several universities in India. As educational institutions were operating in online mode, it was deemed difficult to contact students of higher education directly. Hence, faculty members were chosen as the route to disseminate the questionnaire as they were in contact with the students through online learning classes. These faculty members were requested to forward the questionnaire to their respective students across multiple higher education courses. Higher education courses in India typically comprise “the education, which is obtained after completing 12 years of schooling or equivalent and is of the duration of at least nine months (full time) or after completing 10 years of schooling and is of the duration of at least 3 years” (Ministry of Human Resource Development, 2019). This mainly consists of graduation, post-graduation and other diploma or certification courses.

A total of 1023 responses were received through online survey and since there were no missing values in the collected data, all the responses were used for data analysis. The demographic profile of the respondents is outlined in Table 2.

5 Statistical analysis and results

5.1 Sampling adequacy

The Kaiser–Meyer–Olkin (KMO) test and Bartlett test of Sphericity were performed on the data to assess the suitability of the data for further factor analysis. The KMO

Table 1 Items used in Survey Questionnaire

Constructs	Adapted form	Measurement Items
Awareness of COVID-19	Al-Hattami, 2020	<ol style="list-style-type: none"> 1. Moving to online learning format is a positive protective decision to avoid COVID-19 infection 2. Using the online learning format is a good decision to continue education during COVID-19 situation 3. Online learning during the COVID-19 situation brings more advantages than disadvantages 4. Online learning is a convenient way to continue education and avoid the spread of COVID-19
Computer & Internet Self Efficacy	Hung et al., 2010	<ol style="list-style-type: none"> 1. I feel confident in performing the basic computer functions required for online learning 2. I feel confident in my knowledge and skills of how to manage software for online learning 3. I feel confident in using the Internet to find or gather information for online learning
Online Communication Self Efficacy	Hung et al., 2010	<ol style="list-style-type: none"> 1. I feel confident in using online tools to effectively communicate with others during the online learning sessions 2. I feel confident in expressing myself through text/ chat-box during online learning session 3. I feel confident in posting/ asking questions during online learning sessions
Attitude towards E- Learning	Shaft et al., 2004	<p>Online learning enhances my creativity during COVID-19 situation. Online learning is helpful for me during COVID-19 situation. Online learning is enjoyable. Online learning increases my productivity during COVID-19.</p>
Perceived Net Benefits	Salam & Farooq, 2020	<ol style="list-style-type: none"> 1. Online learning involves all students actively during COVID-19 2. My academic performance is enhanced by using Online Learning during COVID-19 3. Use of Online Learning promotes critical thinking skills and collaborative knowledge building during COVID-19 situation 4. Online Learning has enhanced my interaction with my peers and my teachers during COVID-19 situation 5. I can monitor my individual progress (i.e. personal growth) using Online Learning during COVID-19
Intention towards online learning	Ji et al. (2019); Xu and Wang (2017)	<ol style="list-style-type: none"> 1. I intend to use online learning during COVID-19 situation 2. I plan to use online learning during COVID-19 situation 3. I intend to recommend online learning to others during COVID-19 situation

Table 2 Demographic Profile of Respondents

Categories	Frequency	%
Gender		
- Male	283	27.66
- Female	740	72.34
Age Group		
- 16–20 years	533	52.1
- 21–25 years	425	41.54
- 26–30 years	37	3.62
- 31–35 years	28	2.74
Educational Course		
- Junior college	24	2.35
- Graduation	486	47.51
- Post-Graduation	298	29.13
- Other	215	21.02

measure for our study was 0.957, greater than the acceptable indicator of 0.5, thus signifying that the sample was adequate to conduct a factor analysis. The Bartlett test was carried out to ensure that the variables were completely unrelated, thus concluding that a factor analysis would be appropriate for this set of data (Bartlett, 1950). Bartlett's test of sphericity indicated a significant value as outlined in Table 3.

5.2 Construct reliability and validity

The reliability and validity of the measurement model was sought to be assessed through Cronbach's α and a Confirmatory Factor Analysis (CFA) to examine the construct validity through factor loadings, Composite Reliability (CR) and Average Variance Extracted (AVE). The Cronbach Alpha values ranged from 0.772 to 0.879, above the acceptable threshold of 0.70 for reliable scales (Hair et al., 2006; Nunnally, 1978). CR measures the shared variance among the observed variables of the respective constructs and has been used as an indicator of internal consistency (Fornell & Larcker, 1981). The values for item wise factor loadings, Cronbach's α , CR and AVE for each of the constructs used in the study are as presented in Table 4.

Convergent validity was assessed through an examination of the factor loadings, CR and AVE. Stevens (1996) has opined that sample sizes are important in understanding the significance of factor loadings which may vary with the size of

Table 3 KMO and Bartlett's Test

Kaiser–Meyer–Olkin Measure of Sampling Adequacy		0.957
Bartlett's Test of Sphericity	Approx. Chi-Square	12,529.381
	df	231
	Sig	0.000

Table 4 Construct Reliability and Validity

Construct	Measurement Items	Factor Loadings	Cronbach's α	AVE	CR
Awareness of COVID-19	Moving to online learning format is a positive protective decision to avoid COVID-19 infection	0.65	0.771	0.4567	0.7694
	Using the online learning format is a good decision to continue education during COVID-19 situation	0.734			
	Online learning during the COVID-19 situation brings more advantages than disadvantages	0.588			
	Online learning is a convenient way to continue education and avoid the spread of COVID-19	0.721			
Computer & Internet Self Efficacy	I feel confident in performing the basic computer functions required for online learning	0.705	0.794	0.5390	0.7776
	I feel confident in my knowledge and skills of how to manage software for online learning	0.703			
	I feel confident in using the Internet to find or gather information for online learning	0.791			
Online Communication Self Efficacy	I feel confident in using online tools to effectively communicate with others during the online learning sessions	0.767	0.788	0.5085	0.7557
	I feel confident in expressing myself through text/ chat-box during online learning session	0.688			
Attitude towards Online Learning	I feel confident in posting/ asking questions during online learning sessions	0.681			
	Online learning enhances my creativity during COVID-19 situation	0.765	0.837	0.6090	0.8616
	Online learning is helpful for me during COVID-19 situation	0.791			
	Online learning is enjoyable	0.751			
	Online learning increases my productivity during COVID-19	0.813			

Table 4 (continued)

Construct	Measurement Items	Factor Loadings	Cronbach's α	AVE	CR
Perceived Net Benefits	Online learning involves all students actively during COVID-19	0.734	0.877	0.5906	0.8099
	My academic performance is enhanced by using Online learning during COVID-19	0.827			
	Use of Online learning promotes critical success skills and collaborative knowledge building during COVID-19 situation	0.805			
	Online learning has enhanced my interaction with my peers and my teachers during COVID-19 situation	0.747			
Intention towards online learning	I can monitor my individual progress (i.e., personal growth) using Online learning during COVID-19	0.724			
	I intend to use online learning during COVID-19 situation	0.83	0.865	0.6828	0.8659
	I intend to use online learning to enhance my knowledge during COVID-19 situation	0.823			
	I intend to recommend online learning to my friends during COVID-19 situation	0.826			

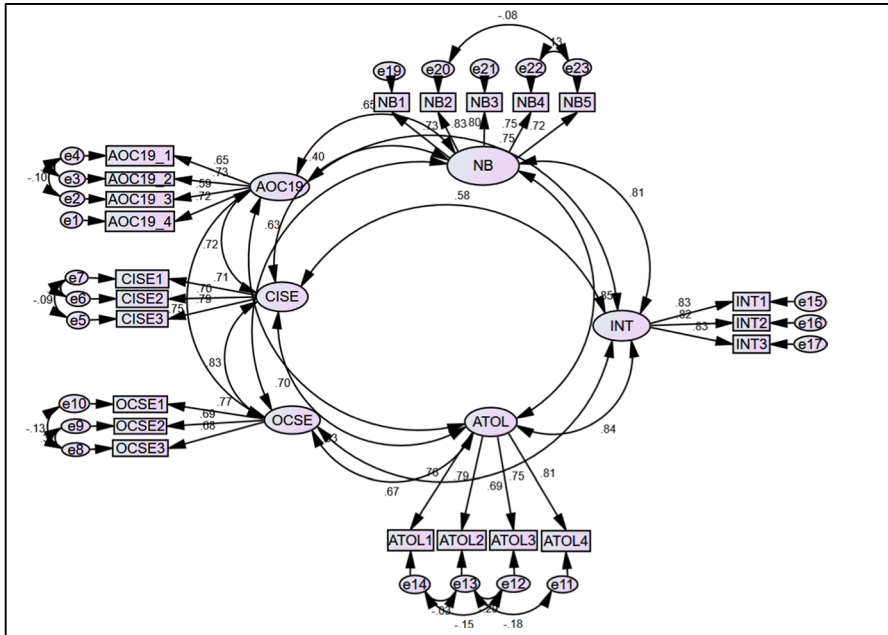


Fig. 2 Confirmatory Factor Analysis—Measurement Model. Legend: AOC19: Awareness of COVID-19, CISE: Computer & Internet Self Efficacy, OCSE: Online Communication Self Efficacy, ATOL: Attitude towards Online Learning, NB: Perceived Net Benefits, INT: Intention towards online learning

the sample. Tabachnick et al. (2007) have cited that 0.32 is a good thumb rule for the minimum loading of an item. Hair et al. (2006) postulate that good convergent validity is demonstrated by item factor loadings greater than or equal to 0.5. Other researchers like Field (2005), Ertz et al. (2016) have also considered factor loadings of greater than 0.4 to be significant. As can be seen from Table 4, all the 22 items have a factor loading of greater than 0.5 thus demonstrating good convergent validity. Additionally, the constructs in the proposed model demonstrate a CR ranging between 0.7557 and 0.8659, well above the acceptable level of 0.7 (Fornell & Larcker, 1981; Nunnally, 1978). Further, as suggested by Fornell and Larcker (1981) the AVE values of five constructs are greater than 0.5, except one construct, the AVE of which is slightly less. Nevertheless, as stated by Fornell and Larcker (1981) “on the basis of pn (composite reliability) alone, the researcher may conclude that the convergent validity of the construct is adequate, even though more than 50% of the variance is due to error” (page no. 46), which was further supported by Lam (2012) and further by Safih and Azreen (2016) as well.

Additionally, as the construct items of this study were adapted from the existing scales, CFA was conducted to assess the measurement model as shown in Fig. 2. This

Table 5 Fit Indices for Confirmatory Factor Analysis

Fit Indices	Recommended Value	Observed Value	Outcome
CMIN/df (minimum discrepancy as indexed chi-square)	Between 1 and 3, 'p' less than 0.05	2.907, $p=0.001$	Good fit
GFI (goodness of fit index)	More than 0.9	0.952	Good fit
CFI (comparative fit index)	More than 0.95	0.972	Good fit
NFI (Normed-Fit Index)	More than 0.95 (Good Fit)	0.958	Good fit
TLI (Tucker Lewis index)	More than 0.95	0.964	Good fit
PNFI (parsimonious normal fit)	More than 0.6	0.755	Good fit
RMSEA (root mean square error of approximation)	Less than 0.08	0.043	Good fit
SRMR (Standardized) Root Mean Square Residual)	Less than 0.08	0.0386	Good fit

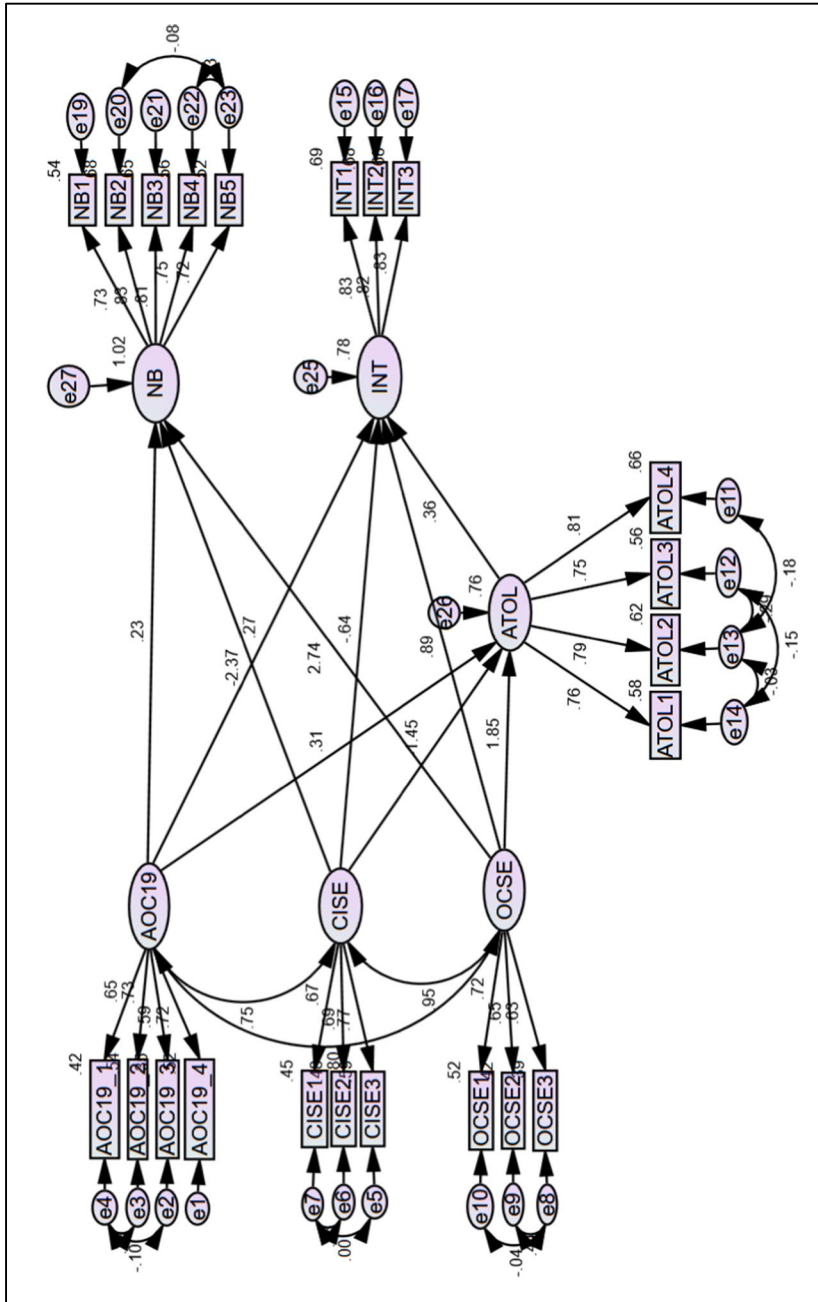


Fig. 3 Structural Equation Model. **Legend:** AOC19: Awareness of COVID-19, CISE: Computer & Internet Self Efficacy, OCSE: Online Communication Self Efficacy, ATOL: Attitude towards Online Learning, NB: Perceived Net Benefits, INT: Intention towards online learning

Table 6 Hypothesis Results – Construct Relationship

Hypothesis Number	Construct Relationship	Standardized Regression Weight	Significance	Outcome
H1	AOC19 → NB	0.177	0.004	Significant
H2	AOC19 → INT	0.193	***	Significant
H3	CISE → NB	-0.396	***	Significant
H4	CISE → INT	0.149	0.061	Partially Significant
H5	OCSE → NB	0.369	***	Significant
H6	OCSE → INT	-0.033	0.697	Non-Significant

measurement model was evaluated through eight different fit indices, and as indicated in Table 5 and the value of all these indices were greater than the threshold limits suggested by Hair et al. (2006), Davey and Savla (2010) and Tabachnick et al. (2007).

In order to test the hypotheses, this study utilized Structural Equation Modeling (SEM) using AMOS 24 software. As suggested by Preacher and Hayes (2008), bootstrapping with 2000 samples was carried out to examine path coefficients and corresponding significance levels. As shown in Fig. 3 and Table 6, the first six proposed hypotheses were tested to check the direct relationships among the constructs. Further, by applying SEM, it was determined that of the six direct hypotheses proposed, four hypotheses were accepted with significant values of $p < 0.05$ (H1, H2, H3 & H5). This reveals that NB is significantly influenced by the three exogenous constructs of AOC19, CISE and OCSE. Moreover, it can be observed that standardized regression weights of CISE show negative values, which indicates an inverse relationship of CISE with NB. Additionally, INT was also found to be significantly influenced by AOC19 as H2 has been accepted. In case of H4 it can be noted that it is partially significant with p value of 0.061 (considering $p < 0.1$), whereas H6 was found to be non-significant. Findings of the H4 reflects CISE to be a partial predictor of the endogenous construct INT.

The six mediation hypotheses (H7 to H12) proposed in this study were tested using the Preacher and Hayes (2004) approach, where bootstrapping procedure is utilized to analyze the indirect effect of mediator, between the exogenous and endogenous constructs. Table 7 highlights estimate values of mediator's indirect effect, which were calculated using 'PROCESS' macro for SPSS, written by Andrew F. Hayes. The mediation analysis suggested that Attitude towards online learning fully mediated the relationship between Computer and Internet Self-Efficacy and Perceived Net Benefits (H8). In case of other five hypotheses H7 and H9 to H12, partial mediation was observed. Thus, it is evident that Attitude towards online learning was found to mediate the relationship of exogenous and endogenous constructs considered in this study.

Table 7 Results of Simple Mediation

H7: Awareness of COVID-19 → Attitude towards Online Learning → Perceived Net Benefits									
Total Effect		Direct Effect		Indirect Effect		Outcome			
Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	Bias corrected bootstrap confidence intervals (95%)	ULCI
0.5827**	0.0285	20.4519	0.158**	0.0267	5.9058	0.3929	0.0244	LLCI	0.4403
H8: Computer and Internet Self-Efficacy → Attitude towards Online Learning → Perceived Net Benefits									
Total Effect		Direct Effect		Indirect Effect		Outcome			
Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	Bias corrected bootstrap confidence intervals (95%)	ULCI
0.3436**	0.0315	10.9061	-0.0001	0.024	-0.005	0.3231	0.0291	LLCI	0.3796
H9: Online Communication Self-Efficacy → Attitude towards Online Learning → Perceived Net Benefits									
Total Effect		Direct Effect		Indirect Effect		Outcome			
Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	Bias corrected bootstrap confidence intervals (95%)	ULCI
0.5407**	0.0269	20.1287	0.1629**	0.0244	6.6705	0.3724	0.0232	LLCI	0.4181
H10: Awareness of COVID-19 → Attitude towards Online Learning → Intention									
Total Effect		Direct Effect		Indirect Effect		Outcome			
Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	Bias corrected bootstrap confidence intervals (95%)	ULCI
0.6596**	0.0268	24.6079	0.2986**	0.0268	11.1472	0.3339	0.0216	LLCI	0.3765
H11: Computer and Internet Self-Efficacy → Attitude towards Online Learning → Intention									
Total Effect		Direct Effect		Indirect Effect		Outcome			
Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	Bias corrected bootstrap confidence intervals (95%)	ULCI
0.5055**	0.0293	17.255	0.2115**	0.0242	8.7559	0.2763	0.0238	LLCI	0.3238
H12: Online Communication Self-Efficacy → Attitude towards Online Learning → Intention									

Table 7 (continued)

Total Effect		Direct Effect		Indirect Effect			Outcome	
Estimate	SE	t value	Estimate	SE	t value	Estimate	SE	Bias corrected bootstrap confidence intervals (95%)
0.5720**	0.0262	21.8093	0.2287**	0.025	9.139	0.3384	0.0227	LLCI 0.2928
								ULCI 0.3826

Legend: SE = Standard Error, LLCI = Lower limit confidence interval, ULCI = Upper limit confidence interval, **p < 0.001.

6 Discussion

Existing literature of online learning have focused on the online learning readiness (Hung et al, 2010), attitude towards computers instrument (Shaft et al, 2004), attitude towards computer-based learning (Hahne et al., 2005; Wenzel & Gotfredsen, 1997), attitudes towards online cooperative learning (Korkmaz, 2012), attitude with respect to personnel and dispositional aspects, procedural characteristics, negative effects and internalization and habituation of use (Coelho Junior et al., 2019), student satisfaction (Liu & Zhao, 2018; Salam & Farooq, 2020). Whereas, this study has attempted to understand the direct effect of online learning during the COVID-19 scenario, on the students' NB and INT (H1 to H6). Moreover, the study has also emphasized on determining how ATOL as a mediator influences NB and INT (H7 to H12), which is an under researched area in the online learning domain. The findings of this study are also useful to understand the contribution of CISE and OCSE on the students' perception of NB and INT during the COVID-19 pandemic.

The findings of the study disclosed that AOC19 has significant positive relationship with NB and INT. This shows that AOC19 has positively influenced the students in higher education to have a positive intention towards the online learning methods and approaches adopted by their respective colleges and universities. Additionally, these students also have a positive perception about the net benefits being derived from their online learning experience. These results support the findings of Al-Hattami (2020) which claimed online learning to be more convenient way to continue education during COVID-19 situation.

CISE was found to have a significant, but inverse relationship with NB. This suggests that higher education students having beliefs about their self-ability to use the computer and internet, do not necessarily drive the positive perception of net benefits of the online learning, but can inversely affect the same. This could be due to the rising expectations of the higher education students from online learning tools and methods, as their CISE increases, and if these expectations are not met, they tend to have negative perception about the net benefits. However, CISE's impact on INT was seen to be positive and partially significant, which was consistent with the findings of Alenezi et al. (2010), Albashrawi et al. (2020) and Fianu et al. (2020).

The study further ascertained OCSE as a significant and positive predictor of NB. This implies that higher education students with ability to effectively communicating online, stimulates the positive perception of net benefits towards online learning. This can be due to the students' ability to communicate effectively over the online platforms which may boost their confidence, subsequently resulting in positive perception towards NB. With respect to INT, though previously Sumuer (2018) found it to be significantly influenced by OCSE, this study revealed to have a non-significant direct relationship among these two constructs.

In the present study, ATOL was considered to be a mediator for the three exogenous constructs and their indirect relationship with NB and INT. ATOL was found to have a significant full mediation among the relationship of CISE and NB. This entails that mediation of ATOL changes the negative direct relationship into a positive indirect relationship with students' perception of NB. In case of two remaining

exogenous constructs AOC19 and OCSE, ATOL was determined as a partial mediator for NB. This means that attitude as a mediator further intensifies the positive relationships among these constructs. While, for the endogenous construct INT, partial mediation of ATOL was noticed in case of all three exogenous constructs mentioned above. This also emphasized the enhancing role of ATOL as a mediator especially for the relationship between OCSE and INT, where the direct effect was found to be non-significant. This was also the case for CISE which indicated a partially significant direct effect on INT. These results supported the findings of Ferrer et al. (2020); Yasin et al. (2020); Alenezi et al. (2010) and Ndubisi (2004), who also studied significance of attitude as a mediator in online learning.

7 Implications of the study

7.1 Theoretical implications

This study contributes to the academic body of knowledge in the online learning field through the examination of NB as an outcome hitherto relatively unexplored in extant research in this domain. The study also examines the newly envisaged construct of AOC19 which is extremely relevant in the pandemic situation. The relevance of AOC19 as a “stimulus” under the SOR theory and its influence on the perception of net benefits by students in higher education is a concrete contribution by this study to the body of knowledge in this domain. While traditionally, the role of ATOL has been examined with respect to outcomes such as student satisfaction (Han et al., 2019; Malkawi et al., 2020; Wu et al., 2010) and intention to adopt online learning modes (Liu & Pu, 2020), this study adds to the existing literature by examining the mediating role of ATOL between the exogenous constructs of AOC19, CISE, OCSE and NB which is a relatively less explored phenomenon in the knowledge field of online learning.

7.2 Practical and social implications

The sudden transition to online learning has posed significant challenges to faculty members. Enhanced student-faculty interaction through the online mode could be one of the alternatives of trying to improve the online communication skills of students which will in turn result in positive attitude and a greater perception of net benefits from the students’ perspective. Additionally, faculty members would also need to engage in creating educational content more suited to the online mode of teaching, develop methods for grading and assessing students’ performance on the online platforms, and also seek to improve their own capabilities with respect to effective delivery of online teaching. From educational institutions’ perspective, it is imperative for them to engage in suitable instructional designs and aim at developing enhanced student experiences which translate into higher perception of benefits from online learning and also a favorable intentional disposition towards online

learning. For the EdTech industry, development of easy to adopt tools which facilitate an enriched user experience for students and faculty members would go a long way in ensuring continued usage of online learning technologies.

8 Conclusions, limitations and future research direction

The ongoing COVID-19 pandemic has been instrumental in the transition of educational institutions towards online learning. This study attempted to assess the impact of the awareness of the ongoing pandemic on the how students would perceive the benefits that would accrue to them through the online learning mode and also attempted to understand the influence of this awareness on the intention of students towards the online learning mode. In addition, important variables such as the efficacy of students on two counts – computer and internet related as well as their online communication skills was also gauged in terms of their influence on perceived net benefits and intention towards online learning. The results have indicated AOC19 has indeed resulted in a perception of enhanced NB from the online learning mode as also a favorable INT of the students. However, over the last decade or so, computer & internet capabilities of the youth in higher education have increased and therefore, being proficient in the use of the computer & internet has resulted in students of higher education having greater expectation from the online learning mode. Online learning modes demand higher levels of communication skills and this is evident from the study where having good online communication skills drives a higher perception of net benefits as well as intention towards online learning. This study is one of the few that has focused on the perception of the net benefits derived from online learning as an outcome. The study also emphasizes the role of students' attitude as an important mediating variable with respect to the relationship between the exogenous and endogenous constructs.

This study has certain limitations. Firstly, it has been carried out during the pandemic situation wherein the online learning mode of education has been necessitated out of a fear of contracting COVID-19 as well as the need to maintain social distancing as stipulated by the governments and regulatory bodies. Therefore, the findings may not be generalizable in a post COVID-19 scenario. Secondly, this study is limited to students of higher education in India, nevertheless, it provides key insights into the factors relevant for the adoption of online learning technologies across the education spectrum. In addition, although the study has been carried out in India, it could open up avenues for future research across different countries. A critical research area would be the examination of how the online learning mode of education would be perceived in a post COVID-19 scenario.

Availability of data and material Yes, can be shared if required.

Code availability Not applicable.

Declarations

Conflicts of interest/Competing interests Not applicable.

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