Impact Assessment of Ease and Usefulness of Online Teaching in Higher Education in Post COVID Era

Imran Saleem, Mushahid Ali Shamsi*, and Hesham Magd

***Abstract*—During COVID-19 and its resulting lockdown, the sudden closure of traditional offline classes resulted in the loss of education. Consequently, teaching pedagogies were unexpectedly changed, and a sudden shift towards online teaching was necessitated. The extensive availability of devices and applications made this shift easy. Nevertheless, all teachers were not equally equipped with the equivalent knowledge and resources, which could have affected their behavioral intention to continue online teaching in the future. This paper investigates the perception of university teachers to continue online teaching in higher education post-COVID. To accomplish this target, a mixed research approach was adopted. For quantitative data, 243 questionnaires were successfully collected from teachers of the top five central universities in India, using an online survey through Google forms by integrating the technology acceptance model (TAM). For qualitative data, online-focused group discussions (FGDs) with around seven teachers from different nations' universities were done. This study is cross-sectional, utilizing TAM factors for ascertaining teachers' behavioral intentions in India. All hypotheses were found significant by applying PLS-based SEM using smart-PLS software. This indicates that perceived usefulness and ease of use significantly impact attitude towards online teaching; further, perceived usefulness and attitude towards online teaching also significantly affect the behavioral intention of teachers to continue online teaching post-COVID era. The study helps educational institutions and respective national policymakers to define the future course of action in the education sector.**

***Index Terms*—Online teaching, teacher professional development, perceived usability, teachers psychology, technology acceptance model.**

I. Introduction

For the first time, human history observed and noted a frozen world. Humanity came to a standstill; nation by nation, industry by industry experienced closure and lockdown. Similarly, the education sector proved to be no exception; the closure of schools and learning institutions and the cancelation of exams created a teaching and learning gap, which disrupted educational institutions' academic calendars and obstructed around 94% of the global student population [1]. As we are aware, the world followed strict social distancing norms, which resulted in the closure of schools and institutions across the length and breadth of the globe leading to disturbed traditional educational practices. According to UNESCO (United Nations Educational, Scientific and Cultural Organization), it affected around 1.5 billion learners in more than 200 countries [2].

Despite the terror of the pandemic, students and the teaching fraternity relaxed for a short while and found ways to overcome this loss. However, as time passed, everybody found the required behavioral change unsustainable. Confinement of youth to safety restricted life in many ways, including loss of education. The teaching fraternity was put to a behavioral change about the teaching pedagogies. There is an imposed situation in the education sector to shift quickly from offline to online teaching and examination to mitigate the loss to the students. Several online teaching platforms, like Zoom, Google meets, Google classroom, and YouTube recorded unprecedented growth. Despite such a shift from offline to online teaching, concerns that are becoming more prevalent among various stakeholders when using education technologies are yet to be addressed because the COVID-19 scenario brought an unprecedented situation that includes a compulsory change in transmission of education mode, i.e., online-only [3].

This technological transformation in education is instant and somewhat untimely because it is unplanned without any strategic preparation concerning its worldwide implementation. The closure of educational institutes brings us to a situation where the primary requirements are to ensure the usability of the online teaching resources and platforms used to deliver education, particularly from the teachers' and students' perspectives [4].

The era of COVID-19 globally evolved a new teaching-learning process that rapidly transformed the traditional offline classroom into an online learning environment. The economic and wide-ranging availability of devices such as laptops and smartphones and several applications like WhatsApp, YouTube, and Facebook, changed the style of people's living, communicating, and getting an education [5]. However, all teachers or students are not equally familiar with and equipped with digital tools, equipment, and knowledge, which evolve the digital divide [6]. Current research, which puts insights into the use of newer devices and technologies, also focuses on the digital divide [7], [8] because the understanding and accessibility of some students and old teachers are minimal [9] and [10]. Hence, the type of devices, technology, and online platforms may affect teachers' usability [4]. As discussed, the scenario of COVID-19 pushed the global delivery model toward online education, so there is a need to measure the usability of the online teaching/learning platforms.

Various theories and models are available to judge individuals' behavioral intentions (BI). Still, when considering the BI related to the technology, TAM is vital and among the most popular and widely-used models. So, to

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explore the usability of the technology used in online teaching, the Technology Acceptance Model (TAM) by Davis [11] was used, which includes two constructs: *perceived usefulness (PU) and perceived ease of use (PEOU)* [4]. *PEOU* is the notch to which the user perceives that using a particular technology would be easy and stress-free. Given online teaching, PEOU is the mark on which a teacher perceives that teaching via an online platform will be easy for them. In comparison, PU is the degree to which a user perceives that using specific technology would help him improve his performance on the job. Regarding online teaching, perceived usefulness refers to the mark on which a teacher believes online teaching platforms will enhance their performance [12].

The constructs of TAM have been used in different contexts by different researchers like communication companies [13], Enterprise resource planning (ERP) [14], Online courses [15], Computers [16], E-Book adoption in an educational institution [17], Mobile maps [18], SPSS [19], PU of Microsoft teams as an online learning platform in COVID-19 era [4], Online learning during a pandemic [20] but there are very few studies which aim to know how Constructs of TAM, i.e., PEOU and PU impact online teaching in higher education in post COVID era. Teachers cannot avoid changes during COVID-19; despite their limited ability to use online teaching, they compulsorily use online platforms for teaching as directed by their institutions. Therefore, applying TAM is interesting to know how technology affects teachers' attitudes (AT) and BI in online teaching.

The concept of pure or hybrid online teaching will how far gain acceptance in the higher education sector is yet to be seen. Possibly, the teaching platform may be abandoned in the post-COVID era, and the traditional teaching system may be restored. What is the satisfaction level of students, teachers, and institutions from the online teaching pedagogy? Will it be a viable option for governments to continue pushing online modes of teaching that may find pretext of cost benefits?

After considering this, the study formulated the following research questions:

1) Do PEOU and PU of online teaching platforms influence teachers' AT to continue online teaching post-COVID-19?
2) Does PEOU and PU of online teaching platforms influence teachers' BI to continue online teaching post-COVID-19?
3) Does a teacher's AT towards online teaching influence their BI to continue teaching online post-COVID-19?
4) Does the direct relation of PEOU and PU with BI to continue teaching online post-COVID-19 mediated through online teaching AT?

Therefore, the present paper is a modest attempt to investigate the perception of university teachers and some university administrators towards potential future courses in higher education teaching. To accomplish this target, TAM model has been adapted from [21], and the listed objectives are formulated for the study (as shown in Fig. 1).

1) To investigate the impact of PEOU and PU on the teacher's AT toward online teaching post-COVID-19.
2) To find out the impact of PEOU and PU on the teacher's BI to teach online post-COVID-19.
3) To determine the impact of a teacher's AT towards online teaching on his BI to continue teaching online post-COVID-19.
4) To explore the mediating effect of AT toward online teaching on the direct relation of PEOU and PU with BI to continue teaching online post-COVID-19.

A. Significance of the Study

The study findings will likely benefit the educational institutions and respective national education policymakers in defining their future course of action in the education sector. Clarity on this front will also help academicians equip themselves with the relevant tools to deliver effectively if the future is likely different from the traditional education system.

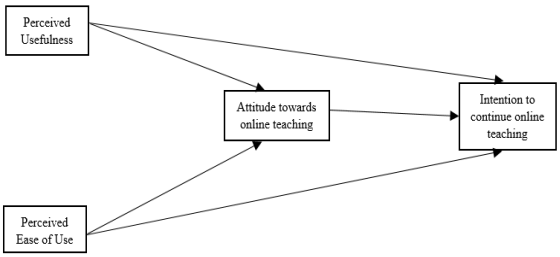

Fig. 1. Model of the study.
Source: Adapted from [21]

II. Literature Review

A. Background of the Study

Several models and theories like the Theory of Reasoned Action (TRA) [22], [23], the Technology Acceptance Model (TAM) [11], [24], the Theory of Planned Behaviour (TPB) [25], the Model of PC Utilization [26], the Decomposed Theory of Planned Behaviour (DTPB) [27], and Innovation Diffusion Theory (IDT) [28] had been developed to explore the acceptance of computer technologies and its affecting factors in organizations. Among these behavioral models, Davis [24] proposed TAM had been widely used in the research where the attitude and BI towards using technology are judged. Here attitude depends upon two variables, i.e., PU and PEOU. That is why TAM and its constructs have been used lavishly in evaluating the issues of user acceptance of technologies, e.g., Sjazna [29] and Nair [30]. Huijts *et al*. [31] define acceptance as the behavior which promotes (support) the use of technology rather than hinders (resistance) the use of it. Researchers like Venkatesh & Davis [32], Venkatesh & Bala [33], and Ariff et al. [34] add or alter the constructs of behavioral models according to their usage and enhance their predictive power. Still, TAM has remained the foremost expectancy-value model and has been a widely applied behavioral model in diverse research scenarios related to technology acceptance.

The pandemic resulted in the closure of global schools, training, and higher education institutes, highlighting educators' need to shift the paradigm in delivering quality education. It could be made possible by using various online platforms like Google Meet, Zoom, YouTube, and Microsoft Teams. However, this shift posed challenges for educators

and learners because shifting from traditional offline learning to online learning is an entirely different experience. They have to adapt compulsorily with no other alternatives available [1].

During the pandemic, universities and schools were closed, and E-learning tools have played a crucial role in facilitating the teaching and learning process. But the adoption of new changes comes up with new challenges. The teachers and students with a fixed mindset find it challenging to adapt to these changes because all are not equally familiar and equipped with digital tools, knowledge, and equipment. As such, it creates a situation of the digital divide, and the type of devices, technology, and online platforms used may affect the usability of teachers [4], [6]. That is why present researchers are attentive to the digital divide, which is specifically related to access to newer technologies and devices [7], [8] and to find ways to adopt an appropriate pedagogy for online education through exposure and expertise in information and communication technologies (ICT) for both learners and educators [1].

Related to the context of online teaching, there were limited studies that used TAM and focused on the usability aspect; this creates a gap in the availability of literature. Dearth's studies used constructs of TAM in the context of online teaching and learning and its adoption among students and teachers [35]. Like the earlier study [36] use TAM to assess the usability of a Moodle-based platform in terms of PEOU and PU related to the actual use of the system. TAM was also used to measure the teacher's BI associated with using various tools in online teaching and found a significant effect of PEOU on teachers' BI [37]. Many researchers like Ngai, Poon, and Chan [38] and Pal & Vanijja [4] extended TAM with additional factors [4]. Still, a study exploring the impact of PEOU and PU on online teaching BI in higher education, especially post-COVID, is needed, filling the literature gap in understating the attitude and BI of teachers related to online teaching.

B. COVID and Its Effects

In December 2019, a novel infectious disease COVID-19 was identified after reporting its first case in Wuhan, China [39]-[43]. To control the outbreak's effects, the WHO (World Health Organization) declared an International Health Emergency on 30 January 2020 [44]. By April 2020, this virus had infected 213 countries, with 1,524,162 confirmed cases and 92,941 deaths [45]. After knowing the intensity of infection, Governments across the World announced a lockdown to minimize the number of cases with containment measures, viz., lockdown, night curfew, social distancing, and travel bans. This step halted routine life and disrupted the world's production, trade, and movements [46].

Consequently, it froze economies and day-to-day activities like education, shopping, businesses, and offices [47]. Research, e.g., Pham *et al*. [48] measuring consumer behavior during the pandemic, has proved that COVID-19 has impacted general human behavior and out-of-home activities, especially education and consumption patterns. At the individual level, the pandemic drastically changed consumer behavior and their way of doing various activities [49]. The severity of the impact of COVID-19 is understood by the disruption of economies and the education system [50], [51]. As traditional face-to-face learning is impossible during this pandemic, higher education institutions worldwide have been pushed towards online teaching [52], [53]. According to Liguori and Winkler [54], this sudden change posed a significant challenge in the educational field because primary, secondary and tertiary education institutions were faced with forced and premature closure with them looking for alternatives for teaching and learning pedagogies. It was made possible by using online teaching platforms, which are used to fight this invisible enemy [55] and protect the socio-economic loss of world communities.

C. Acceptance of Technology among Teachers

The sudden expansion and up-gradation in ICT explore the need to redefine and validate the behavioral models to create effectiveness in understanding and using digital technologies in the educational field [56]. The research of Granic and Marangunic [57] on applications of TAM gives an overview of current TAM-based studies related to the academic field. After reviewing, researchers discover that TAM has arisen as a primary scientific model for identifying the acceptance of learning and teaching technologies by learners, educators, and other stakeholders. Previous studies focused on quantitative and questionnaire-based analyses. Still, recent studies focus on the significance and impact (direct) of external factors on BI, ease of use, and usability, which adds various extensions and modifications to the original model [57].

These modifications (TAM++ or TAM2) enlarged the interaction between the primary (PEOU, PU, ATU) and external variables like self-efficacy, university support, and social factors. Several significant variables and factors are identified between teachers' BI and digital tools usage relation in the studies other than TAM-specific. Lockton and Fargason's [58] study discussed that a crisis-induced change forced numerous teachers to preserve their identities, social beliefs, or the norms followed in the schools. According to researchers like Wohlfart, Trumler & Wagner [56], the readiness of teachers to adopt online teaching and a confident attitude toward digital tools usage both impact the adoption of digital technologies and tools into the teaching process. Teachers and learners are benefited from these digital tools [59]. Still, a gradual change in things results in a deficiency of learning and training opportunities, and this pandemic leads to inefficiency for teachers concerning digitalization and digital literacy [60].

D. Applications of Technology Acceptable Model (TAM)

TAM is frequently used in studies relating to technology claims [61]. TAM, which is an expanded version of the Theory of Reasoned Action, provides a progressive paradigm that exemplifies how technology is accepted or rejected [11]. TAM is a model that explains why people are more likely to use an online platform for learning, teaching or other purposes, making it appropriate for study in the current environment [62].

Among the many user acceptance models of innovations and technology, TAM is one of the most commonly tested and recognized models across organizations [63]. Davis [11]

developed the TAM theory that he derived from [22] Reasoned Action theory, which they offered after making changes to the idea of planned action. The model explained how BI had a favorable impact on performance. The model accurately depicts PU and PEOU, demonstrating how people react to new ICT and online platforms. The greater the simplicity of the use of technology, the greater the level of acceptability. In the same vein, the more widespread the use of technology, the more likely it is to be adopted [64]. It is essential to balance the two drivers to avoid other possibilities of reducing the benefits of adopting innovation and technology due to difficulty. This model for ICT or different online systems acceptance can highlight the relationship between belief, attitude, intention, and conduct [65]. TAM analyses and studies the adoption of technology, in which the BI and its control are driven primarily by its PU and PEOU constructs [66].

Researchers discovered a strong link between PU and BI in investigating people's perceptions. Another study by Chintalapati & Daruri [67] on teaching-learning activities through YouTube is backed by the earlier findings. From time to time, TAM has been frequently employed positively in e-learning [66], [68], and [69]. TAM is discovered to be an economic construct of theories that can be applied to specific or general situations [64] and [70]. Most of the above-reviewed studies are based on the acceptance or use of technologies in normal situations, but as we know, COVID brings unpredictable situations in every industry and sector. The education sector has no exception from this; to cope with these situations, online teaching was imposed as a forced factor. It was imposed on every teacher, young or old, familiar or unfamiliar with the technology and equipped or not equipped with the resources. Therefore, the study that judges the BI of teachers to continue online teaching post-COVID period, moreover the impact of ease of use and usability of online teaching platforms on teacher's attitude and BI is the need, which helps in filling the gap of literature in the stated objective direction. In this study, the researchers observe the links between TAM's many components and teachers' BI to continue online teaching indefinitely, even after the COVID-19 impacts.

III. Hypothesis Development

A. Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Attitude (AT)

The *PEOU* has been an essential predictor of online teaching acceptance. The perceived ease of usage influences attitude about using ICT in teaching and learning [11]. The perceived ease of use relates to the ease with which new technology may be handled or learned. In this approach, a positive belief or perception leads to a more positive attitude toward technology adoption and continuous usage [27], [65]. Furthermore, studies [71] and [72] have shown that PEOU influences users' desire to use online platforms for teaching and learning. According to [73], PEOU is an essential predictor of PU and BI to utilize technology.

On the other hand, PU indicates user's increased task efficiency after utilizing specific technology. Schillewaert *et al*. [74] investigated the mediating role of PU and discovered a substantial mediator between PU effects and their impact on BI to adopt the technology. PEOU and PU are two crucial influencing factors that significantly affect technology adoption and attitude, according to Tan and Teo [75] and Chen et al. [76]. Positive correlations have been found between users' online experiences and emotional and cognitive images, according to Xiao & Zhao [77]. Alraimi [78] and Xia et al. [79] claim that PU significantly affects the popularity of online courses (MOOCs). Almugari et al. [80] found that the technology could be adopted due to the application's simplicity of deployment.

Yang and Su [81] examined the willingness of learners to engage in and respond to IT and online teaching techniques in MOOCs (Massive Open Online Courses). They found that learners' attitudes is one of the most significant influencing factors for their BI to use online platforms. Through research, Bamberg, Ajzen, & Schmidt [82], Davis, Bagozzi, & Warshaw [65], and Taylor and Todd [27] discovered that attitude has a substantial impact on BI. Previous experiences, according to [22], may have various behaviors owing to problems; moreover, it determines the number of the individual's inclinations toward adoption. Another study by Teo & Zhou [83] identified mindset as one of the most significant factors to consider while utilizing technology.

H1: PEOU in online teaching positively influences teachers' AT towards online teaching post-COVID-19.

H2: PU of online teaching positively influences teachers' AT toward online teaching post-COVID-19.

B. Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Behavioral Intention (BI)

PU is the notch to which the user perceives that using specific technology would help him improve his job performance. Regarding online teaching, perceived usefulness refers to teachers' belief that using an online teaching platform will improve their performance [12]. As per the TAM, PEOU influences the PU because, other things being equal, an effortless technology is more likely to be accepted by the users [29]; however, Davis [11] proved PU as the more robust predictor of user's intention to use the technology than PEOU. Similarly, Ha *et al*. [84] evidenced that PU significantly and positively influences online BI. Nevertheless, Troise *et al*. [85] supported the insignificant direct effect of PU on BI.

The likelihood of repeating a particular behavior in the present or in the future is referred to as BI. When the behavior intends to use a variety of approaches or methods, the typical roadblock or impediment will be insignificant. Even strong behavior modification can lessen the possibility of activity abandonment [22], [86]. Ajzen [86], [25] therefore saw perceived behavior and behavioral intention as motivators and enablers for task completion. A user's perceived behavioral control determines whether they have the resources and opportunities needed to complete a task in a particular way. If true, to what extent can the behavior be controlled? It has been discovered that when a person has more appropriate resources to encourage him to employ a specific pattern of behavior, they are more likely to follow through on a solid BI to use that pattern or technique [27].

H3: PEOU in online teaching positively influences teachers' BI to teach online post-COVID-19.

H4: PU of online teaching positively influences teachers' BI to teach online post-COVID-19.

C. Attitude (AT) and Behavioural Intention (BI)

Attitude characterizes as favorable or unfavorable psychological and neuronic readiness toward a place, person, event, or thing [87]. According to Fishbein's [22] expectancy-value model, a person's AT towards some product or object is regarded as a function of their opinions about various features and qualities of the object and evaluative aspects of those opinions, i.e., liking or disliking towards object or product's characteristics and attributes [23], [88], and [89]. Therefore, attitudes indicate the individual's overall response concerning the object or product [4]. Any change in the set of opinions/estimations allied with them can lead to a change in attitude [23], which changes with a change in intentions [90]. Therefore, BI to use of the technology is measured as a function of PU and AT toward using the technology. With the progressive up-gradation in TAM, Davis [11] recommended many cases where a given system was perceived valuable; a person may form a solid BI to use the system without developing an AT. Thus such BI can regulate the actual usage of the technology [65]. But various researchers have validated that a positive AT towards an object, product, or anything forms its BI [81] and [85].

H5: AT toward online teaching positively influences teachers' BI to continue online teaching post-COVID-19.

D. Mediating effect of Attitude (AT)

Previous research has shown that attitude acts as a mediator in various direct relationships, increasing (or decreasing) the effect of the relationship between dependent and independent variables. Furthermore, attitude is an essential variable in the theory of planned behavior that influences individuals' intentions positively [25], [86]. Given this, the current study developed the following hypothesis to investigate the mediating role of attitude in the relationship of perceived ease of use and perceived usefulness with teachers' behavioral intention to continue online teaching post-COVID-19.

H6: AT toward online teaching positively mediate the relationship between PEOU and teachers' BI to continue online teaching post-COVID-19.

H7: AT toward online teaching positively mediate the relationship between PU and teachers' BI to continue online teaching post-COVID-19.

IV. Methods and Design

The present study has adopted a mixed research approach (including quantitative and qualitative techniques) to assess the perception of university teachers and administrators to continue online teaching in higher education in the post-COVID era. It integrates the TAM as a quantitative approach and online focus group discussions (FGDs) as a qualitative approach. A conceptual model was cognized with underlying variables of TAM viz. PEU and PU as determinants of the BI. Further, online FGDs were done using an online meeting platform, viz. Zoom [1](FGDs were available on YouTube) with several university teachers, administrators, and government functionaries of multiple countries to have qualitative inputs for our study. The study explores the direct influence of PU and AT on BI to continue online teaching.

Moreover, PEOU and PU have a direct influence on attitudes toward online teaching. For quantitative data, 253 questionnaires were successfully collected from the top five central university teachers and administrators in India using an online survey through Google Forms. Moreover, for qualitative data, the FGDs with around seven teachers (Professor, Associate Professor, and Assistant professors), administrators of universities, and government functionaries of different nations were conducted, which helped us to elicit their perception of online teaching and its future. The study applies PLS-based SEM, using Smart-PLS software, for testing the conceptual model.

A. Participants and Data Collection

In the present study, teachers (Professor, Associate Professor, and Assistant professors) were taken as a sample, which was drawn from the top five central universities of India, i.e., Aligarh Muslim University (Uttar Pradesh), University of Hyderabad (Telangana), Jamia Millia Islamia (New Delhi), Banaras Hindu University (Uttar Pradesh), and Jawaharlal Nehru University (New Delhi). Around 1000 respondents were contacted for questionnaire filling requirements through various WhatsApp groups, social networking sites, and emails based on the snowball sampling method, and of them, 290 responded, but after data screening, the study was left with 253 usable responses. A series of FGDs were also done, which lasted for about 2 hours each, with teachers from different universities worldwide and government officials from India on 01/05/2020, 04/05/2020, and 10/05/2020 using an online platform viz. Zoom meeting, seven teachers and government officials from India, Malaysia, Canada, and Washington DC put their insights on online teaching and its future.

B. Questionnaire Development

After shortlisting central beliefs and concerns, the literature review was done, and a questionnaire was administered online using a 7-point Likert scale (from 1 strongly disagree to 7 strongly agree). The questionnaire was based mainly on the TAM model adapted from [21]. The language of questions was checked to meet the local need for contextualization. The study consists of four latent constructs, viz. PEOU, PU, AT, and BI. Items of each construct borrowed from a previously published study, i.e., [21]. Double-barrelled items and jargon were also ignored from the scale items. Table III consists of scale items.

C. Data Screening

Before drawing any statistical inference, the collected data was analyzed and scrutinized for careless responses and statistical outliers. Moreover, to protect the data from missing frequencies. The response of each questionnaire item was

[1] FGDs link: https://www.youtube.com/channel/UCabyIBqqfL5cI5nbbEX-72g/videos

made mandatory in the survey form; therefore, no missing value was found in the data set. But 28 careless and 19 potential statistical outlier responses were found, showing Cook's value above the suggested limit of 1 [91]. These 47 responses were removed from the dataset, and the final samples constitute 253 responses.

V. Results

A. Descriptive Statistics

Table I necessarily depicts the description of 253 respondents, 41.5% were female, while 58.5% were male. We had access to the most significant number of Assistant Professors (47%), followed by Associate Professors and Full Professors. The coverage of the most considerable number of Assistant Professors logically led to the highest number of respondents under 35 years of age, making it nearly 36 percent.

TABLE I: Demographic Profile of the Respondents

Demographic variable	Frequency	Percentage (%)
Gender		
Male	148	58.50
Female	105	41.50
Designation		
Assistant Professors	118	46.64
Associate Professors	59	23.32
Full Professor	76	30.03
Age		
Under 35	91	35.96
36 – 40	39	15.41
41 – 45	36	14.22
46 – 50	26	10.27
51 – 55	22	08.69
56 – 60	27	10.67
60 – 65	12	04.74

Note: Author's own calculation

TABLE II: Standard Deviation, T-Test

Latent Variable	Designations	Mean (Std. Deviation)	t-test
ITCOT	Assistant Professor	5.28	-.835 (.763)
	Associate/Full Professor	5.16	
ATOT	Assistant Professor	5.25	-1.421(.251)
	Associate/Full Professor	4.90	
PEOU	Assistant Professor	5.04	-.597(.930)
	Associate/Full Professor	4.97	
PU	Assistant Professor	5.05	-.595(.931)
	Associate/Full Professor	4.98	

Note: Author's own calculation

The mean and standard deviation for the variables covered are shown in Table II. Assistant Professors have a higher mean for the composite variable than other categories. To determine whether there was a significant difference between the various categories, we also performed a t-test. The t-test results reveal that mean-variance is relatively insignificant for other variables and significant for attitude variables.

TABLE III: CFA Loadings, AVE, CR, and Cronbach's Alpha

Constructs	Items Loadings (≥ 0.70)	Cronbach's Alpha (≥ 0.70)	CR (≥	AVE (≥ 0.50)
Attitude towards online teaching (ATOT) Source: [21]		**0.836**	**0.901**	**0.753**
"Online teaching is a good idea".	0.734			
"Online teaching has a positive influence on me".	0.887			
"I think it is valuable to teach online to my class".	0.846			
"I am favorable towards online teaching in comparison to traditional classes".	0.869			
Behavioral intention to teach online post-COVID-19 (ITCOT) Source: [21]		**0.856**	**0.902**	**0.698**
"I have plans to conduct online classes through various platforms in the future".	0.841			
"There is a high probability that I will conduct an online class in the future".	0.822			
"I will increase using online teaching platforms for my class to enhance students' learning interests".	0.845			
"I would love to use online teaching platforms for my class".	0.834			
Perceived ease of Use (PEOU) Source: [21]		**0.840**	**0.893**	**0.677**
"I find it easy to teach online to my class".	0.746			
"Conducting online classes is easy and understandable".	0.869			
"Online teaching is more flexible to teach than traditional one".	0.847			
Perceived usefulness (PU) Source: [21]		**0.851**	**0.898**	**0.688**
"Using online teaching for my class helps me to control the pedagogy".	0.814			
"Using the online teaching medium in my class enhances teaching performance".	0.837			
"I find online teaching useful for my class".	0.846			
"Using an online teaching method makes it easier to catch individual students' needs".	0.821			

Note: Author's own calculation

B. Outer Model Evaluation

The quality of the psychological constructs in this paper is assessed using an outer model in Smart-PLS software. This

model takes into account the psychometric properties of the scales used. We assessed the constructs' discriminant and convergent validity. Cronbach alpha and composite reliability (any value above 0.70 is acceptable) are used to decipher the scale's reliability [92], [93]. Table III shows that the value of Cronbach alpha and composite reliability for all the constructs are higher than the given thresh holds limits and hence is acceptable [94], [95]. As a result, we can trust the constructs used in the study. The outer loading values (factor loading) and average variance extracted (AVE) are used to assess the convergent validity. The outer loading value of all the constructs are greater than the threshold limit of 0.70. However, if such values only deviate marginally, then their deletion does not improve the AVE; the construct may continue to be accepted even if its value is slightly less than 0.70 [95] and [96].

TABLE IV: INTER-CONSTRUCTS CORRELATIONS AND DIVERGENT VALIDITY

Variables names	ATOT	ITOPC	PU	PEU
ATOT	**0.868**			
ITCOT	0.745	**0.835**		
PU	0.618	0.590	**0.830**	
PEOU	0.768	0.756	0.654	**0.823**

The squared root of AVE has been shown in bold on diagonals for divergent validity. **ATOT**= Attitude towards online teaching; **ITCOT** = Intention to continue online teaching; **PEOU** = Perceived ease of usefulness; **PU** = Perceived usefulness.

Note: Author's own calculation

The Average Variance Extract values were also higher than the 0.50 [97] cutoff, ranging from 0.677 for PEOU to 0.753 for ATOT. The Fornell and Larcker [98] criterion was used to assess discriminant validity. Table IV shows that the measures have achieved the desired level of discriminant validity. Because all of the constructs have met the necessary standards of validity and reliability, we can safely proceed to hypotheses testing.

C. Hypothesis Testing

Table V presents the results of hypotheses testing covering the complete data set. The table reveals that the relationship of all the constructs is significantly high; thus, all seven hypotheses have been accepted. The bootstrapping procedure in the Smart-PLS software is used to calculate the significance. The ease of teaching online significantly impacts BI to teach online. It should be noted that if the attitude is formed, it has an even more significant impact on BI to teach online in the post-COVID era. Similarly, the usability of online teaching significantly impacts BI toward online teaching, but the impact of PU on BI is increased when attitudes toward online teaching is formed. Furthermore, the direct effect of attitude towards online teaching on BI to continue online teaching and the direct effect of PEOU and PU on attitude towards online teaching are found significant.

TABLE V: HYPOTHESIS TESTING

Independent	Direct Effect		Indirect Effect
Variable	On ATOT	On ITCOT	On ITCOT via ATOT
PU	0.372***	0.325***	0.108**
PEOU	0.698***	0.332***	0.203***
ATOT	–	0.291***	–
$\mathbf{R^2}$	0.614	0.726	–

p-value less than 0.05, ***p-value less than 0.001. **ATOT= Attitude towards online teaching; **ITCOT** = Intention to continue online teaching; **PEOU** = Perceived ease of usefulness; **PU** = Perceived usefulness.

Note: Author's own calculation.

VI. DISCUSSION

The outcomes showed that H1, H2, H3, H4, H5, H6, and H7 significantly supported and successfully fulfilled the objectives of this study (as represented in Fig. 2).

The result of H1 indicates that the PEOU of online teaching positively influences teachers' AT towards online teaching in the post-COVID era. Further, hypothesis H2 shows that PU of online teaching positively influences teachers' attitudes toward online teaching post-COVID. This hypothesis testing fulfills our first objective and shows that ease in new technology usage creates positive belief or perception, which leads to a more favorable AT toward technology adoption and continuous use of that technology. Our results of H1 resemble [21], [71], [72] studies that the PEOU of technology significantly and positively influences users' AT. The results of H2 are associated with [21], [78], [79] studies which state that PU positively influences AT of users and suggests that more excellent usability of technology leads to a more extraordinary favorable attitude toward technology adoption.

By accomplishing the second objective and accepting H3 and H4, the study implies that when teachers perceive greater ease in using online teaching software and platforms, their BI to use it increases. This acknowledges that the PEOU of online teaching influences teachers' BI to continue online teaching after the COVID era. Previous studies [84] confirmed these findings. Moreover, the study also confirms that the more teachers believe that using an online teaching platform will enhance their performance; the more will be the BI of a teacher to use it. These results state that the PU of online teaching positively influences teachers' BI to continue online teaching post-COVID era. This result is the same as [21], [84] studies in which PU is a factor that affects the BI.

The results of H5 state that a positive AT towards online teaching positively influences teachers' BI to continue online teaching post-COVID. It means a change in the beliefs can result in a shift in AT, which automatically changes BI. Therefore, the third objective of the study is fulfilled, and it states that teachers' BI to continue online teaching positively correlates with their attitude toward online teaching. The same results were reported in [21], [90] studies that AT is the factor that positively influences the BI of consumers.

After fulfilling, the fourth objective of the study confirms the mediating effect of attitude on PEOU-ITCOT and PU-ITCOT relations; consequently, H6 and H7 were accepted. This means that although the direct effect of PEOU and PU on ITCOT is positive but when these relations are mediated with the variable like attitude towards online teaching, their effect on ITCOT will significantly increase. Meanwhile, when teachers perceive ease and usability in using online teaching platforms and software, they form the intention to continue their use post-COVID, but the effect of these variables on behavioral intention will increase when the

teacher forms a strong attitude toward online teaching.

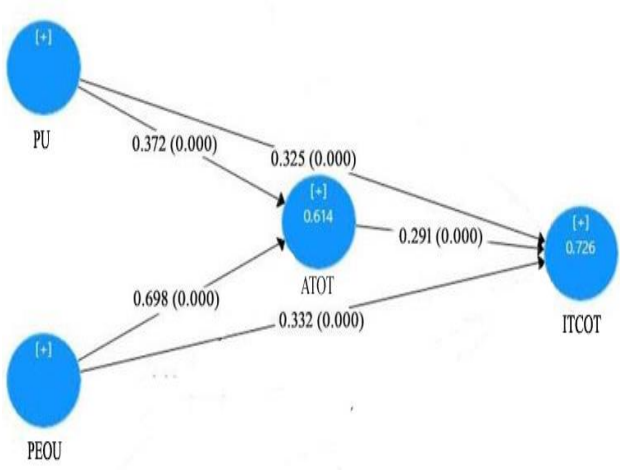

Fig. 2. Final tested model.
Note: Author's calculation

Similar to our results, we found the same perception among teachers and government administrators of different nations about online teaching in our online FGDs. The discussion points with the name and designation of persons are given below:

A professor from one of the top business schools of India is very optimistic about the shift and feels that with due training and gradually increasing acceptance of online learning, academics, Professional training & research will jump into the newer trajectory of education. He further suggested that artificial intelligence and digitization may be encouraged to ensure the optimum usage of tools and techniques in online teaching.

A professor from *Washington DC* and **Associate Professor** from Canada believe that educational institutions need to identify the technical inputs required to meet their teaching challenges. The technology helps solve issues like immediate access, better understanding, audio-visual support through digitization of information, and effective online teaching. Variables like the flexibility of the teaching schedule and student interest call for the convergence of efforts and increased acceptance of online teaching.

An Assistant Professor from another university in Canada emphasized on providing adequate training and awareness programs for teachers, students, and the community. He also noted that preferences and activities of Students, relationship building, value creation, and character providing of students remain some of the issues to be addressed. He emphasized that to reap the benefits of technological advancement in education, the students, teachers, trainers, government, and the community at significant need to converge their efforts. As per our model, attitude appears to be a precursor to BI. Thus, we must develop quality input in digitized form to build confidence and attitude towards online teaching.

One more **Associate Professor** from a university in Canada focuses more on using the technology to channel the possibility of developing information repositories that are authentic and dependable for stakeholders from across the world. It is beyond doubt that online communication has flattened the world. Further, students sitting in the remote village have real-time access to the learned Professors of the best institution in the world. Additionally, he deliberated on the Skewness of technology's resources, like software, hardware, and bandwidth.

We think that even organizing a series of webinars with participants worldwide is evidence of the possibility of converging the efforts and wisdom worldwide. The conversion of physical classes into online will open up various opportunities for universities and students in terms of collaborations, international linkages, and development for reaching relations with the masses. However, all said and done, the human face of the teaching-learning process is a missing shot. Online teaching lacks in helping the students in peer-group collaborations and deeper relationships. These issues, like humanitarian bonds, remain to be tapped.

A professor from Malaysia has pointed out the need to develop an appropriate business model for resource generation. In the COVID scenario, online teaching is likely to generate lesser revenue than offline teaching, especially in the private sector. To cap it all, the government should play a very positive role in filling the gap in technology access to society's have-not section.

Joint Secretary in Ministry of Finance, Government of India, suggests that the government should act as a shield to protect the education system. However, it may be cautioned that the government should not take online teaching as an absolute substitute for traditional teaching to reduce the education budget. Resources need to be diverted gradually to strengthen and popularize online education to let it slowly evolve and be accepted by society.

VII. Conclusion, Limitation, and Future Direction

The paper has endeavored to test the TAM model. It has successfully demonstrated that teachers and educational administrators have a very high likelihood of intention to teach online in the post-COVID period. Due to unprecedented pandemic situations worldwide, online teaching-learning was a forced factor rather than a matter of choice. Most teachers and administrators have learned online interaction and teaching during the pandemic era, found it robust enough, and intend to go for online or hybrid education in the post-COVID era, to which we are no exception. Understanding that the teachers have a positive inclination toward adopting online teaching pedagogy soon calls for practical training for the teachers to hone their online teaching skills are apparent.

Secondly, our study also reveals that Assistant Professors, i.e., the younger generation is more willing to take up the challenge of teaching online and have effectively picked up. Similarly, the FGDs reasserts that Assistant Professors are more conversant with online interaction. In contrast, Associate and Full Professors lag, but they are willing to continue if equipped with ease of use and usability.

This research's theoretical and practical advantages may be used to analyze its implications. This study provides new empirical data on the relevance of TAM in assessing technology adoption and helps in forming strong and effective norms, particularly for online teaching, for theoretical implications. Then there are the practical

implications of this research, which educational researchers, policymakers, and government may utilize to develop strategies and appropriate training programs for online learning and teaching. This is primarily aimed toward Associate and Full Professors, who will benefit from the ease of adoption and increase their knowledge about the usefulness of online interaction.

The educational institutes and governments may utilize our results to create awareness and develop learning programs for the online teaching pedagogy and tools to boost the ease and intent of teaching online.

Likely the acceptance of online modes will increase in the future. It would substantially reduce operational costs. Therefore, it is suggested that institutions can go online or use a hybrid education system to ensure effectiveness in the education sector and the economic up-gradation of countries. There is also a likelihood of increased convenience for the students and faculty members as with due training and exposure, they may become more concurrent with the E-education technology, but due to income disparities worldwide, all may not have owing access to and use of new technology. So, it is strongly recommended that educational institutions and governments make all-out efforts to create and facilitate due infrastructure to facilitate universal educational access in real terms.

However, this study compromises some limitations with future directions. It is a cross-sectional study, and the main limitation of a cross-sectional is that there is generally no evidence that exposure covered the way for the occurrence of the outcome or not. Second, as discussed above, various theories were used to judge the BI related to the technology, but in this study, we used only TAM factors for judging the teachers' BI. In the future, researchers may also use other theories and factors that are not included in the present study because online teaching is a complex scenario involving multiple factors such as; the quality of the teaching resources, the level of support provided by the system, the UI design of the teaching system, interactivity, and learnability, all of which can have an impact on its use. The current work seeks to capture one aspect of the whole user experience, but future research may focus on the broad user experience aspect. Third, we circulated the study questionnaire only to India's top five central universities due to restraining time and cost. Our FGDs depict the same opinion of teachers from three nations other than India; however, additional empirical evidence is required for generalization. Therefore, the findings of this study are not generalized to other countries. Future researchers can conduct the same research by taking other countries and more universities from India to understand the online teaching BI of teachers post-COVID-19. Furthermore, the current study is based on teachers' perspectives. We believe students' opinions should also be investigated using a similar or expanded version of the current model.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS CONTRIBUTIONS

Prof. Imran Saleem is a Co-author of this research work and contributes to Supervision, Investigation, writing – review, Methodology, and editing.

Mushahid Ali Shamsi is a Corresponding Author in this research work and contributes to Data curation, conceptualizing, Investigation, original draft, Formal analysis, Methodology, editing, and review.

Prof. Hesham Magd is a Co-author in this research work and contributes to conceptualization, Methodology, Supervision, review, and editing.

DECLARATIONS

Consent to participate: All individuals taking part in the study gave their informed consent. Before sending the complete survey instrument, sample questions and information about the questionnaire's theme were given in advance to the respondents.

Ethics approval: Our departmental committee decided not to require ethical approval for this study because the data was anonymized, and no personal information, including contact details or email addresses, was requested.

Data availability statement: The datasets produced and utilised in the current study are available upon justifiable request from the corresponding author.

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