Web-based videoconferencing for teaching online: Continuance intention to use in the post-COVID-19 period

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Abstract. Web-based videoconferencing has gained a great momentum worldwide, with extremely high adoption rates during the COVID -19 pandemic. The current study aims to investigate the use of web-based videoconferencing for teaching in the post-COVID-19 landscape. The study proposes and evaluates a model to predict continuance intention to use videoconferencing systems, from the perspective of University teachers. The proposed model combines constructs from the Technology Acceptance Model (TAM) and the Expectancy Confirmation Model (ECM). Sixty-six academic staff members filled out a survey questionnaire about their attitudes towards continuing using videoconferencing systems for teaching in the post-Emergency Remote Teaching (ERT) period. Partial Least Squares (PLS) was used to test the measurement and the structural model. The model explains and predicts 73% of the total variance in continuance intention to use. User satisfaction with web-based videoconferencing and perceived usefulness are the top two strong predictors. Implications for school administrators and instructional designers are discussed.

Keywords: Distance education and online learning, improving classroom teaching, web-based videoconferencing, emergency-remote education, continuance intention to use

1 Introduction

During the first half of 2020, educational institutions around the world, following the introduction of social distancing measures and in an effort to help mitigate and prevent the spread of the virus that causes the global COVID-19 pandemic, moved their instruction from face-to-face to online. The long established traditional face-to-face classes have been replaced with online lectures, seminars, tutorials and meetings. Scholars agree that this shift from face-to-face to online, as an alternative teaching delivery method during the pandemic crisis, was a temporary and emergency approach and completely different form the online distance education model [1]. This temporary shift has been described as Emergency-Remote Teaching (ERT) [2] and was aiming to provide temporary access to instruction. From the other side, online and distance education are "pedagogical concepts in their own rights" [3] resulting from planned

instructional design and using learning theories, models and standards focusing on quality [4]. During that ERT period, web-based videoconferencing and communication tools such as Zoom, Skype, Google Meet, Microsoft Teams, GoToMeeting, Cisco WebEx have become very popular teaching and meeting platforms. Videoconferencing technologies uses synchronous audio and video to connect, in real-time, physically separated users. In an effort to replicate face-to-face classes, educators have used these tools for broadcasting live lectures and for communicating and collaborating synchronously in seminars and tutorial sessions [5]. According to a survey on the immediate priorities and responses of U.S. higher institutions to the global COVID-19 pandemic [6], synchronous video was one of the main practices used by faculty when classes moved online (along with other methods such as asynchronous recorded video or material distribution through the various institutional Learning Management Systems). Zoom seemed to be the preferred videoconferencing platform worldwide. There has been a massive increase of Zoom users worldwide during the first months of 2020, while the teleconferencing company made 27 million dollars in the first quarter expecting its sales to double [7].

This emergency shift of instructional delivery to online can be considered as a global "experimental setting" [8] where educators were encouraged and/or forced to use videoconferencing systems for replicating their in-person teaching [9]. The specific educational technology has gained a great momentum worldwide during the pandemic [10]. Different studies on videoconferencing systems have praised the benefits of this technology as a promising tool for online meetings and consultations [11, 12, 13]. Early studies investigated students' perceptions about videoconferencing in teacher education [14]. For example, a study on the design of blended synchronous courses found that students liked the flexibility and convenience of attending lessons via two-way videoconferencing [15]. However, based on a recent literature review [16], no study exists on teachers' perceptions about web-based videoconferencing. Our current study aims to investigate teachers' perceptions about web-based videoconferencing and focuses on teachers' intention to continue use videoconferencing systems for teaching in the post-COVID era. Continuance refers to a form of post adoption behavior. Continuance intention to use, seen under the lens of the expectancy confirmation theory [17], results from a combination of factors such as satisfaction, confirmation and perceived usefulness. Our study identifies the factors that can drive academics to continue use videoconferencing systems in order to further support their online or blended teaching (online lectures or tutorial sessions, virtual meetings with students, etc.), even if they will not have to do it (e.g. when the social distancing policies will no longer be in-place). Understanding the factors that influence continuance intention to use videoconferencing for teaching would be useful in order to effectively incorporate these systems in well-designed e-learning strategies and to better develop engaging online learning environments.

The organization of the study is as follows. The next section presents the Technology Acceptance Model and the Expectation Confirmation Model that frame the theoretical background of the investigation along with the need for the specific study. After explaining the rationale for investigating continuance intention to use videoconferencing systems for teaching in the post-ERT period, the study presents the research model with the hypotheses to be tested. Methodology section (participants, procedure and instrument) follows with the data analysis and results section to come

afterwards. Discussions and conclusions for the impact in education follow along with the limitations of the study and future work.

2 Background

2.1 Technology Acceptance Model (TAM)

User acceptance is a critical factor for the successful implementation of Information Technologies. Therefore, explaining and predicting technology system adoption is an important research area. Technology Acceptance Model (TAM) is an information technology model that provides an understanding on how information technology is accepted by users [18]. Two key determinants that influence users' behavioural intention to use a technology, are the perceived usefulness and the perceived ease of use [18], as figure 1 shows. Perceived usefulness has been defined as "the degree to which a person believes that using a particular system will enhance his/her job performance" and perceived ease of use as "the degree to which a person believes that using the system would be free of effort" [18]. After its first introduction, a large number of variables have been also found to significantly influence users' acceptance of information systems [19]. Facilitating conditions (the supportive infrastructure for the use of an information system) and social influence (the belief that important persons approve and support a particular behaviour) are two such variables that have been introduced through the Unified Theory of Acceptance and Use of Technology (UTAUT) model [20] which is a major successor of TAM.

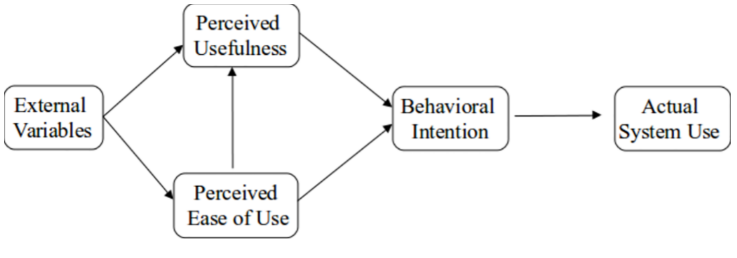

Fig. 1. Technology Acceptance Model (Davis, 1989)

2.2 Expectation Confirmation Model (ECM)

The Expectation Confirmation Model [17] has been derived from the Technology Acceptance Model [18], the Theory of Planned Behavior [21] and the consumer behavior literature. ECM focuses on the links between perceived usefulness, confirmation, satisfaction, and ultimately continuance intention to use [17]. According to the ECM in the consumer behaviour literature [22], user's satisfaction is the most significant factor that influences continuance intention to use and therefore positively affects repurchase intention. Similarly, in the context of information systems and e-

learning research, users' continuance intention to use is determined primarily by their satisfaction with prior use [23, 17]. Confirmation (the degree to which users' original expectations before using an online learning system are confirmed by their perceived performance of the system after its use) also affects continuance intention to use [24]. The perceived usefulness of an Information System from TAM is also positively associated with their satisfaction and continuance intention to use information systems [17]. Figure 2 depicts the original ECM Model [17].

Fig. 2. Bhattacherjee's Expectation Confirmation Model (2001)

The model has been successfully applied in the context of information technologies explaining and predicting continuance intention to use [25]. Previous studies investigated users' continuance intention to use different educational technologies such as digital textbooks [26, 27], teaching blogs [28], computer-based assessments [29], mobile social learning environments [30, 31] and mobile Web 2.0 learning [32]. Most of the studies on e-learning continuance intention [33, 34, 23, 35, 36, 37, 38, 24, 39] highlight that perceived usefulness and satisfaction have the most significant effect (Table 1). Most of the these studies utilise the Expectation Confirmation Model as their main theoretical framework along with variables from other models such as Information System Success model in [33], Theory of Planned Behaviour in [23], Task-Technology Fit in [35, 28] and Self-Determination Theory in [40, 41].

Considering the aforementioned gap in the related literature, the current study combines variables form TAM and ECM in order to explain and predict continuance intention to use videoconferencing systems for teaching purposes. Videoconferencing has been primarily designed for video calling and business meetings allowing synchronous distance communication over the Internet using cameras and microphones. Videoconferencing is available for use at the discretion of the users only in the border concept of as part of an online learning system, e.g. the videoconferencing feature in the Blackboard e-learning system [42]. However, during the pandemic, the majority of teachers have use stand-alone videoconference applications (e.g. Zoom, Skype, WebEx) as primary synchronous learning environments (without the full range of e-learning platforms) to replicate face-to-face teaching. The forced shift to replicate face-to-face classes via synchronous online teaching using web-based videoconferencing underpins a rare experimental opportunity to investigate factors that influence continuance intention to use in the post-ERT landscape.

Table 1. Studies on continuance intention to use online learning

Study	Model(s)	Factors affecting Continuance Intention to Use
[17] Bhattacherjee (2001)	ECM	Perceived usefulness and confirmation can predict user satisfaction. Satisfaction is the most significant predictor of continuance intention to use an information system with perceived usefulness to follow.
[28] Chen et al. (2015)	TAM, TTF	Confirmation has a direct effect on perceived usefulness, while satisfaction is jointly determined by perceived usefulness and confirmation. Satisfaction and perceived usefulness significantly predict continuance intention of teaching blogs along with perceived voluntariness and habit.
[38] Dai et al. (2020)	ECM	The variables of attitude and curiosity (added to the ECM) were found to significantly explain continuance intention with attitude to play the dominant role. Confirmation has a major impact on satisfaction to use MOOCs.
[32] Dalvi-Esfahani et al. (2020)	TTF, TPB, TAM, U&G	Mobility, social interaction, and information exchange as gratifications, perceived ease of use, perceived usefulness, attitude, perceived behavioral control, subjective norms, and task-technology fit determine continuance intention to use mobile-based web 2.0 learning
[33] Dağhan et al. (2016)	ISS, ECM	Information quality, system quality and service quality can explain confirmation of the usage of online learning environments. Moreover, information quality, system quality, service quality, confirmation, utilitarian value, outcome expectations and perceived value can explain satisfaction. Satisfaction has the strongest effect continuance intention to use e-learning systems.
[46] Daneji et al. (2019)	ECM	Confirmation has significant effects on students' perceived usefulness and satisfaction. Perceived usefulness and satisfaction have significant effects on students' continuance intention MOOCs while perceived usefulness has no significant effects on students' satisfaction.
[25] Deng et al. (2010)	TAM, ECM	Perceived utilitarian and hedonic performance and expectation disconfirmation of Information Technologies (IT) significantly predict satisfaction and satisfaction predicts continuance intention to use IT.
[34] Hung et al. (2011)	TAM, TTF, ISS	Perceived usefulness and system satisfaction have major impacts on continuance intentions to use web-based learning systems.
[26] Joo et al. (2017)	ECM	Perceived usefulness and satisfaction have a direct and positive influence on continuance intention to use digital textbooks.
[31]Kaewkitipong et al. (2016)	ECM, UTAUT	Perceived usefulness, system satisfaction and social influence significantly predict user satisfaction and satisfaction can significantly predict continuance

		intention to use social media in e-learning environments.
[23] Lee (2010)	ECM, TAM, TPB	Confirmation has a significant effect on satisfaction and perceived usefulness. Satisfaction has the most significant effect on users' continuance intention to use web-based learning systems, followed by perceived usefulness, attitude, concentration, social influence, and perceived behavior control.
[35] Lin and Wang (2012)	ECM, TTF	Perceived usefulness and system satisfaction have major impacts on continuance intentions to use e-learning systems.
[30] Ooi et al. (2018)	TAM	Social and mobile aspects significantly affect satisfaction and satisfaction predicts continuance intention to use mobile social learning platforms.
[40] Roca and Gagne (2008)	TAM, SDT	Perceived usefulness, perceived ease of use and perceived playfulness are predicted by perceived autonomy support, perceived competence and perceived relatedness and also they predict e-learning continuance intention to use in the workplace.
[39] Rodríguez-Ardura and Meseguer-Artola (2016)	TAM	Perceived usefulness and perceived ease of use determine users' attitudes towards e-learning usage and attitudes along with flow and presence explain continuance intention to use.
[41] Sørebø et al. (2009)	ECM, SDT	Confirmation predicts intrinsic motivation, perceived usefulness and satisfaction. Intrinsic motivation, perceived usefulness and satisfaction predict teachers' continuance intention to use e-learning technology.
[27]Stone et al. (2013)	ECM	Confirmation influences perceived usefulness of electronic textbooks and satisfaction with electronic textbooks. Satisfaction and perceived usefulness of electronic textbooks influence electronic textbook continuance intention.
[43] Terzis and Economides (2013)	ECM and TAM	Direct determinants of continuance acceptance of computer-based assessments are confirmed ease of use and confirmed playfulness.
[36] Wang et al. (2019)	TAM	Computer self-efficacy and enjoyment (as intrinsic motivations) significantly predict continuance intention to use cloud-based e-learning environments.

ECM: Expectation Confirmation Model [17], ISS: Information System Success model [66], SDT: Self-Determination Theory [67], TAM: Technology Acceptance Model, [18], TPB: Theory of Planned Behavior [21], TTF: Tack Technology Fit model [68], U&G: Uses and Gratifications Theory [69], UTAUT: Unified Theory of Acceptance and Use of Technology [20].

3 Conceptual Framework and Hypotheses

The proposed conceptual framework combines constructs from the Technology Acceptance Model [18] and the Expectation Confirmation Model (ECM) [17] and is

aiming to explain and predict continuance intention to use web-based videoconferencing for teaching in the post-ERT landscape. For that purpose, we have developed the following hypotheses.

3.1 Facilitating Conditions (FC)

Facilitating Conditions (FC) are "the degree to which an individual believes that the organizational and technical infrastructure exists to support the use of the system" [20]. Facilitating Conditions have a positive impact on behavioral intention to use [20]. Moreover, research has shown that Facilitating Conditions significantly influence Perceived Ease of Use [43, 44]. With the appropriate technical infrastructure and a supporting environment, users perceive the technological system as easier to use. Therefore, we hypothesize that:
H1. Facilitating Conditions (FC) have a positive effect on Perceived Ease of Use (PEOU).

3.2 Perceived Ease of Use (PEOU)

Perceived Ease of Use has been defined as "the degree to which a person believes that using the system would be free of effort" [18]. When users feel that it is easy to use an information system, it is more likely to use it. A recent meta-analysis [19] provided evidence that Perceived Ease of Use is a major factor that influences attitudes towards using e-learning technologies. Early technology acceptance literature has shown that Perceived Ease of Use has a positive effect on Perceived Usefulness [45, 18]. Later studies have also confirmed the positive impact of Perceived Ease of Use on Perceived Usefulness in different areas such as e-learning [23], mobile learning [44] and MOOCs [37]. Therefore, for our model for web-based videoconferencing systems we hypothesize that:
H2. Perceived Ease of Use (PEOU) has a positive influence on Perceived Usefulness (PU).

3.3 Social Influence (SI)

Social Influence (SI) is the "degree to which an individual perceives that important others believe he or she should use the new system" and it is a strong predictor of the individual's intention to adopt a new technology [20]. Moreover, Social Influence positively affects users' perceptions about the system's usefulness [44, 37]. For our model for web-based videoconferencing systems we also hypothesize that:
H3. Social Influence (SI) has a positive effect on Perceived Usefulness (PU).

3.4 Confirmation (CONF)

Confirmation is users' perceptions of the congruence between expectations of a system use and its actual performance [17]. The construct has been designed to measure the degree to which academic staff expectations before using videoconferencing for teaching were consistent with their expectations from actual videoconferencing for teaching use. According to the ECM, Confirmation of initial expectations of

information systems usage has a positive effect on the users' Perceived Usefulness of the system. A number of studies provided evidence for the casual link between Confirmation and Perceived Usefulness for e-learning technologies [41], web-based learning systems [23], MOOCs [46], teaching blogs [28], electronic textbooks [27]. Moreover, Confirmation of initial expectations of IS usage has a positive effect on the users' satisfaction. When users' expectations are confirmed, users are more satisfied with the system usage. Previous studies provided evidence on the confirmation-satisfaction link for e-learning technologies [41, 23], MOOCs [38, 46], and electronic textbooks [27]. Based on previous studies, we hypothesize for videoconferencing systems that:
H4. Confirmation (CONF) has a positive effect on Perceived Usefulness (PU).
H5. Confirmation (CONF) has a positive effect on Satisfaction (SAT).

3.5 Perceived Usefulness (PU)

Perceived Usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" [18]. Users are more likely to use an information system when they perceive it as useful. There is a body of research investigating the impact of Perceived Usefulness on users' Satisfaction and Continuance Intention to Use. Studies provided evidence on the significant effect of Perceived Usefulness on user Satisfaction from e-learning [33, 31, 41]. When user perceive e-learning systems as useful, they reach higher levels of satisfaction. In addition, when users perceive the system as useful, they are more likely to continue use it. Perceived Usefulness is a significant predictor of Continuance Intention to Use e-learning systems [41, 39, 32], including MOOCs [46, 37]. Based on previous studies, we hypothesize for videoconferencing systems that:
H6. Perceived Usefulness (PU) has a positive effect on Satisfaction (SAT).
H7. Perceived Usefulness (PU) has a positive effect on Continuance Intention to Use (CIU).

3.6 Satisfaction (S)

According to the expectation confirmation theory and the consumer behaviour literature [22], satisfaction is the most significant factor that influences continuance intention to use and positively affects repurchase intention. In the information systems literature, the Expectation-Confirmation Model [17] also considers satisfaction as a strong predictor of the intention to continue using information systems. Moreover, studies provided supporting evidence for a wide range of e-learning technologies. Satisfaction predicts Continuance Intention to Use web-based learning systems [34, 35] and mobile social learning platforms [30]. User continuance intention is associated with a high level of satisfaction from the use of MOOCs [46]. Satisfaction is also a significant determinant of continuance intention for digital textbooks [27, 26] and mobile learning [47]. Therefore, in the context of video-conferencing we can also hypothesize that there is a positive effect of satisfaction of use on the continuance intention to use. Therefore:
H8. Satisfaction (SAT) has a positive influence on Continuance Intention to Use (CIU).

Based on the previous hypotheses, we have developed the model shown in Fig. 3 to explain and predict the intention to continue using web-based videoconferencing for teaching. The model combines variables from TAM and ECM.

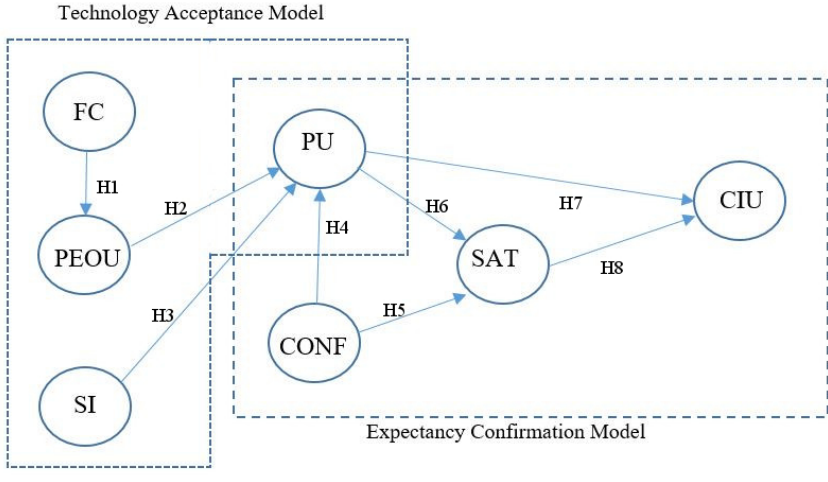

Figure 3. The proposed model for web-based videoconferencing CIU

4 Methodology

4.1 Participants and Procedure

The target population of this research includes the academic staff members of the Humanities and Social Sciences Department from a UK University (following a convenience sampling method). Data were gathered from 66 academic staff members with teaching and/or supervision responsibilities. The demographic profile of the respondents is displayed in Table 2. There were 38 (57.6%) females and 25 (37.9%) males included in this study, while three (4.5%) preferred not to answer. Regarding respondents' discipline, 30 (45.5%) of them were from the School of Education, 5 (7.6%) from the School of Government and Public Policy, 9 (13.6%) from the Social Work and Social Policy, 7 (10.6%) from the Psychological Sciences and Health, 7 (10.6%) from the Law School and 8 (12.1%) from the School of Humanities. In terms of respondents' teaching experience, 43 of them (65.2%) had more than 15 years of teaching experience, 16 of them (24.2%) had 6 to 15 years' experience and 7 (10.6%) had less than 6 years of teaching experience. Respondents' experience in using web-based videoconferencing systems was variable: 13 (19.7%) reported more than 3 years of experience, 14 (21.2%) reported 1 to 3 years' experience while 39 (59.1%) reported less than a year experience.

Table 2. Demographic profiles of the participants

Variable	Category	Frequency	Percentage (%)
Gender	Female	38	57.6
	Male	25	37.9
	No answer	3	4.5
School	Education	30	45.5
	School of Government -Public Policy	5	7.6
	Social Work and Social Policy	9	13.6
	Psychological Sciences and Health	7	10.6
	Law	7	10.6
	Humanities	8	12.1
Teaching experience	More than 15 years	43	65.2
	6 to 15 years	16	24.2
	Less than 6 years	7	10.6
Video-conferencing experience	More than 3 years	13	19.7
	Between 1 to 3 years	14	21.2
	Less than 1 year	39	59.1

From the middle of March 2020, the normal capacity of the University campus has been interrupted and staff undertaken teaching were required to deliver their teaching online. Most classes thereafter scheduled in web-based videoconferencing platforms. These online platforms offer a series of features that facilitate online communication, host or joining a meeting, managing participants in a meeting, screen sharing, creating and managing breakout rooms, chatting in a meeting, in-meeting file transfer, polling and recording meetings. To facilitate and support the shift to online teaching, the University developed tutorials and training sessions for academic staff. Teaching staff members encouraged to use web-based videoconferencing (integrated either in the University LMS or as a standalone application) for their lectures and seminars. The current study on the use of videoconferencing systems from the academic staff members carried out during the second half of June 2020 and the first half of July 2020. An online questionnaire has been developed on Qualtrics. The researcher emailed the questionnaire along with the participant information sheets and the consent forms to the academic staff members of the Humanities and Social Sciences. Participation was completely voluntarily and answers were fully anonymous.

4.2 Instruments

The questionnaire consisted of two parts: 4 demographic questions (corresponding to the four variables in Table 2 above) and 19 questions related to the proposed model. For the development of the second part of the questionnaire, we adopted items from previously validated instruments.

Perceived Ease of Use (PEOU) with three items and Perceived Usefulness (PU) with three items were measured according to the scale design developed by [18]. Social Influence (SI) with two items were measured according to the scale design developed by [20]. For Facilitating Conditions (FC) we used two items from [48] which have been

used by other studies [44]. For Satisfaction (S) we adopted three items from [49]. For Confirmation (CONF) we adopted two items and for Continuance Intention to Use (CIU) we adopted four items from [17]. Participants answered on a seven-point Likert-scale ranging from 1 (not at all true) to 7 (very true). Appendix A presents the 19 items questionnaire used in the study.

5 Data Analysis and Results

Partial Least-Squares (PLS) with Smart PLS 2.0 [50] was used to predict and explain the factors influencing continuance intention to use. Our sample size exceeds the recommended value of 30 e.g.10 times the largest number of independent variables impacting a depended variable [51].

5.1 Instrument validation

To ensure the quality of the model, we have verified the internal consistency, convergent and discriminant validity of the proposed research model. All criteria for convergent validity are satisfied: all factor loadings on their relative construct exceed 0.70, composite reliability of each construct exceed 0.70 and all average variance extracted (AVE) values range from 0.713 to 0.812 (AVE > 0.50) exceeding the variance due to measurement error for that construct (Table 3). Discriminant validity is also supported since the square root of the average variance extracted (AVE) of a construct is higher than any correlation with another construct (Table 4). Thus both convergent and discriminant validity for the proposed research model are verified [52].

Regarding the overall model fit we have used the Goodness-of-Fit criteria, as proposed by [53]. Goodness-of-Fit is calculated by using the geometric mean value of the average communality (AVE values) and the average R^2 of the endogenous values. Acceptable values of Goodness-of-Fit are 0.10 (small), 0.25 (medium), and 0.36 (large) indicating the global validation of the path model. The Goodness-of-Fit of our model was 0.60 indicating that our model has a good fit.

Table 3. Descriptive statistics and results for convergent validity for the measurement model (acceptable threshold values in brackets).

Construct Items	Mean (SD)	Factor Loading (>0.70)	Cronbach's a (>0.70)	Composite Reliability (>0.70)	Average Variance Extracted (>0.50)
Perceived Ease of Use	5.03 (1.18)		0.887	0.927	0.811
PEOU1		0.947			
PEOU2		0.949			
PEOU3		0.797			
Perceived Usefulness	4.27 (1.20)		0.799	0.881	0.713
PU1		0.854			
PU1		0.865			

PU3		0.813			
Social Influence	5.01 (1.24)		0.704	0.871	0.771
SI1		0.874			
SI2		0.883			
Facilitating Conditions	4.66 (1.07)		0.742	0.885	0.793
FC1		0.911			
FC2		0.870			
Satisfaction	4.84 (1.16)		0.827	0.898	0.747
SAT1		0.912			
SAT2		0.778			
SAT3		0.897			
Confirmation	4.69 (1.17)		0.771	0.896	0.812
CONF1		0.881			
CONF2		0.921			
Continuance Intention to Use	5.37 (1.21)		0.893	0.927	0.761
CIU1		0.932			
CIU2		0.782			
CIU3		0.830			
CIU4		0.936			

Table 4. Discriminant validity for the measurement model (values in bold: the square root of the average variance extracted for each construct).

	CIU	CONF	FC	PEOU	PU	SAT	SI
CIU	**0.872**						
CONF	0.553	**0.901**					
FC	0.355	0.239	**0.891**				
PEOU	0.594	0.537	0.207	**0.900**			
PU	0.794	0.612	0.253	0.455	**0.844**		
SAT	0.796	0.698	0.303	0.808	0.735	0.**864**	
SI	0.607	0.573	0.543	0.398	0.578	0.626	**0.878**

CIU- Continuance Intention to Use, CONF – Confirmation, FC – Facilitating Conditions, PEOU – Perceived Ease of Use, PU – Perceived Usefulness, SAT – Satisfaction, SI – Social Influence.

5.2 Test of the structured model and hypotheses

Structural model and hypotheses are supported by the value and the significance of the path coefficients (bootstrapping procedure have been applied to measure t-values) and the variance measured (R^2) by the antecedent constructs. Figure 4 and Table 5 summarize the structural model and the hypothesis testing results. Figure 4 shows the

path coefficient for each path and the R^2 for each endogenous variable. Table 5 shows the statistical significance of the relations in the model. The results from the PLS analysis support all our eight hypotheses. All standardized path coefficients have values between 0.136 and 0.491. These values are considered medium to large [54]. Facilitating Conditions have a direct positive effect on Perceived Ease of Use (0.208). When proper infrastructure and user support exist, teachers perceive the videoconferencing system as easy to use for their teaching. Perceived Ease of Use (0.136) and Social Influence (0.320) can significantly affect Perceived Usefulness. The above findings are in-line with the technology acceptance research [18]. Confirmation has been found to significantly predict Perceived Usefulness (0.365) and Satisfaction (0.398). Confirmation of teachers' expectations from using web-based videoconferencing systems for teaching has a positive effect on their satisfaction. Also, when teachers' expectations from the system are confirmed, they also perceive the system as useful for their teaching. Perceived Usefulness has a significant effect on Satisfaction (0.491) and Continuance Intention to Use (0.454). Teachers are satisfied by using videoconferencing for teaching and are willing to continue using it when they perceive it as useful. Moreover, Satisfaction has a significant effect on Continuance Intention to Use. When teachers are satisfied by using web-based videoconferencing for teaching, they are more likely that they will continue using it. The above casual links are in-line with the original Expectation Confirmation Model [17] and with most studies included in a literature review of the factors affecting adoption, the continuation of technology use, and learning outcomes [24]. Moreover, the size of the estimated causal link between Satisfaction and Continuance Intention to Use in our model is comparable to the path coefficient found in most studies in the meta-analysis of Satisfaction and Continuance Intention to Use Educational Technology [55].

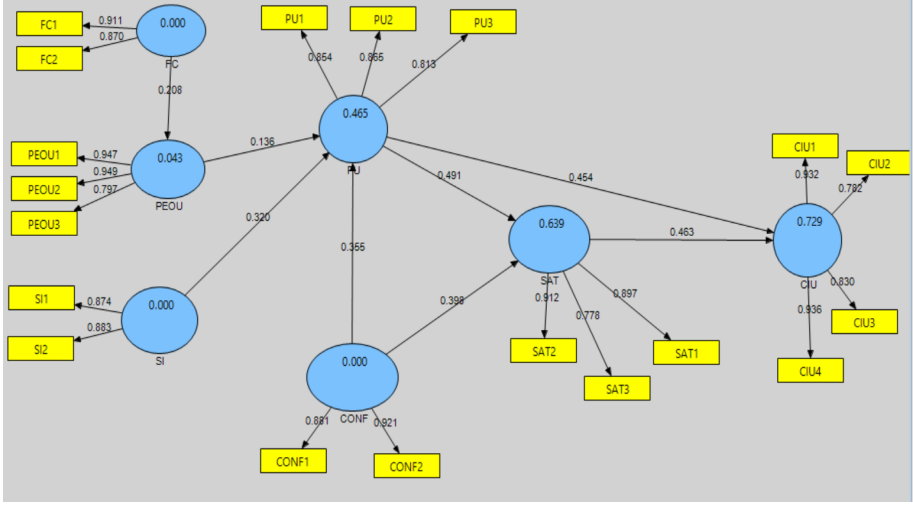

Fig. 4. SEM analysis of the proposed model

Table 5. Hypothesis testing results.

Hypothesis	Path	Results	
H1	Facilitating Conditions → Perceived Ease of Use	0.208***	support
H2	Perceived Ease of Use → Perceived Usefulness	0.136**	support
H3	Social Influence → Perceived Usefulness	0.320***	support
H4	Confirmation → Perceived Usefulness	0.365***	support
H5	Confirmation → Satisfaction	0.398***	support
H6	Perceived Usefulness → Satisfaction	0.491***	support
H7	Perceived Usefulness → Continuance Intention to Use	0.454***	support
H8	Satisfaction → Continuance Intention to Use	0.463***	support

**p < 0.05, ***p < 0.01.

The construct of Continuance Intention has the highest mean value (5.37) followed by Perceived Ease of Use (5.03) and Social Influence (5.01). Teachers are willing to continue using videoconferencing for teaching. They perceive web-based videoconferencing as easy to use for their teaching. They also reported a rather high social pressure (apparently due to the need for emergency remote education) from important others (e.g. University) to use web-based videoconferencing for their teaching.

The values of R^2 for the variables of Perceived Usefulness, Satisfaction and Continuance Intention to Use are 0.465, 0.639 and 0.729 respectively. According to the model, Perceived Ease of Use, Social Influence and Confirmation explain about 46% of the total variance in Perceived Usefulness. Perceived Usefulness and Confirmation explain about 64% of the total variance in Satisfaction. Satisfaction and Perceived Usefulness explain about 73% of the total variance in Continuance Intention to Use, with Satisfaction to be the most important factor.

6 Discussions and conclusions

The current study has been conducted during a period of a global educational disruption due to the COVID-19 pandemic, where teachers used web-based videoconferencing for replicating their lectures online. The purpose of the study is to identify factors that affect University teachers' continuance intention to use web-based videoconferencing systems (such as Zoom, Skype, MS Teams, WebEx, etc.) for replicating and moving their teaching from the physical classrooms to online in the post- COVID-19 period. To the best of our knowledge, our study is one of the first that focus on teachers' attitudes towards videoconferencing systems for teaching and their continuance intention to use. A synopsis of the theoretical and practical contributions of the study follows.

The main theoretical contribution of the study is that it combines the Technology Acceptance Model and the Expectation Confirmation Model to explain and predict continuance intention to use web-based videoconferencing for teaching in the post-COVID era. Satisfaction with web-based videoconferencing is the strongest predictor of users' intention to continue using it for teaching followed by perceived usefulness. The findings of the current study are in line with previous research on technology acceptance theory [18, 20] and expectation confirmation theory [17]. The study

confirms the casual links of confirmation and perceived usefulness with satisfaction and the link between satisfaction with continuance intention to use, as these have been found in previous research studies [34, 23, 27, 28, 26]. The study also confirms the impact of perceived ease of use and social influence on perceived usefulness [32, 31, 19].

The main practical contribution of the study is that it provides evidence (from the teachers' perspective) for the feasibility of continuing using videoconferencing systems for teaching after the COVID-19 pandemic is over and when social distancing will not be in place. Most of the web-based videoconferencing systems have been mainly designed for virtual meetings and online collaboration and they do not usually integrate all features that most sophisticated e-learning platforms do. Research has shown that the adaptation of videoconferencing systems in certain learning environments can have a positive impact on how learners learn and interact [56]. During the school closures due to the imposed lockdowns in the pandemic, videoconferencing has been extensively used to replace physical classrooms with online, facilitating in such a way the continuity of education. Further successful integration of this technology in educational practices depends (among other factors) on teachers' attitudes [57] and their intentions to continue using it [23]. Our study can inform developers, school administrations and instructional designers for the accelerating factors of using videoconferencing in online and/or blended learning environments to further support the synchronous aspect of e-learning.

The study results confirmed the influence of the facilitating conditions on perceived ease of use and that of social influence and perceived ease of use on perceived usefulness. In our study, teachers with no or low previous experience in videoconferencing were encouraged to use this technology by means of the appropriate technical infrastructure and the supportive institutional culture. When web-based videoconferencing is easy to use, synchronous online class communication cannot be a technological barrier for teachers.

Study findings revealed that teachers perceived web-based videoconferencing as useful since it can enhance their teaching. Participants found breakout rooms "extremely helpful to promote online collaboration" and the polling feature was a "simple but powerful tool for student engagement". Videoconferencing systems can support multiple pedagogical approaches from both the cognitive and socio-constructivist perspectives [16]. Transactional distance theory argues that the distance in online courses (beyond temporal and cognitive) can be emotional and cognitive [58, 59]. During the current unpresented circumstances, videoconferencing helped teachers to overcome the aforementioned barriers between them and their students and maintained an environment that can support cognitive and social presence [60]. Studies have documented the casual links of cognitive presence (delivering knowledge) and of social presence (feeling connected to others) with perceived usefulness [61]. Videoconferencing has been used to deliver synchronous online lectures (knowledge transfer) and polls (formative assessment), to provide different channels of online communication (for discussion and reflection), to support teamwork through the use of breakout rooms (for collaborative knowledge construction), to encourage information sharing and presentation through screen sharing and to record lectures to be used asynchronously for future reflection. Cognitive and social presence can further improve teacher presence online and enhance real-time interactions in distance education [62].

Perceived usefulness found to be a significant predictor of teachers' satisfaction and continuance intention to use. When the capabilities of the videoconferencing system satisfy teachers' expectations, then teachers will continue use the system. Considering the strong link between confirmation and satisfaction, instructional design should carefully plan instructional activities because disconfirmation of teachers' expectations can lead to dissatisfaction and discontinuance. Previous studies have shown that when videoconferencing is used solely as a lecturing tool then it fails to create effective learning communities [63]. Therefore videoconferencing should support online learning interactions in order to be prescribed as satisfying. In summary, teaching episodes through web-based videoconferencing should be effortless, useful and satisfying. Faculty satisfaction is also considered an important factor of quality in online [64] and blended learning [65]. Future online courses should integrate the opportunities offered by videoconferencing to further support online interactions between learners and teachers when face-to-face interactions are impossible.

The study has limitations. The main limitation of the study is its use of a convenient small data sample. However, other relevant studies with small sample sizes also exist (e.g. in [42] with 158 university teachers and in [26] with 137 responses). Future studies need to reach larger teacher audiences in a variety of contexts. Moreover, the effectiveness of web-based videoconferencing technology on online teaching and learning should be based on the experience and engagement of both parties (teachers and students) in the online learning environment. Therefore, our future studies will investigate students' continuance intention to use videoconferencing systems for learning as well.

Moreover, deeper investigation of teachers' and students' attitudes on specific features of such systems such as breakout rooms, whiteboard, screen sharing, etc. would be useful to further support the transition from traditional in-person instructions to online modalities. Our current wider research agenda on the impact of the COVID-19 pandemic on teachers' and students' perceptions about online learning, includes the aforementioned investigations as well.

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Appendix A

The questionnaire used in the study.

Constructs	Items	Questions	Sources
Perceived Ease of Use	PEOU1	My interaction with the system is clear and understandable.	Davis (1989)
	PEOU2	I find the system easy to use.	
	PEOU3	It is easy for me to become skilful at using the system.	
Perceived Usefulness	PU1	Using the system will improve my work.	Davis (1989)
	PU2	Using the system will enhance my teaching.	
	PU3	Using the system will increase my productivity.	
Social Influence	SI1	The seniors in my university have been helpful in the use of the system.	Venkatesh et al. (2003)
	SI2	In general, my university has supported the use of the system.	
Facilitating Conditions	FC1	When I needed help to use the system, someone was there to help me.	Thompson et al. (1991)
	FC2	When I needed help to learn to use the system, system's help support was there to teach me.	
Satisfaction	SAT1	I am satisfied with the use of the system.	Lin et al. (2005)
	SAT2	I am pleased with the experience of using the system.	
	SAT3	My decision to use the system was a wise one.	
Confirmation	CONF1	My experience with using the system was better than what I expected.	Bhattacherjee (2001)
	CONF2	The functionalities provided by the system were better than what I expected.	
Continuance Intention to Use	CIU1	My intentions are to continue using the system.	Bhattacherjee (2001)
	CIU2	I will continue using the system in the future.	
	CIU3	If I could, I would like to discontinue my use of the system.	
	CIU4	I intend to continue using the system rather than discontinue its use.	