

Perceived Usability of Zoom application as an online learning platform during COVID-19: Using Technology Acceptance Model and System Usability Scale

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Abstract

The COVID-19 epidemic has forced the closure of all sorts of educational institutions across the world. In this regard, the perceived usefulness of the existing online learning systems is crucial, especially given the absence of physical classrooms. The Zoom learning application is chosen as the reference platform in this study to assess perceived usability. The System Usability Scale (SUS), which is a Human Computer Interaction (HCI) based method, and the Technology Acceptance Model (TAM), which is an Information Systems (IS) based approach, are used to evaluate the system. The major objective of this study was to measure the perceived usability online learning platform and examine the impact of TAM factors and SUS on recommendation intention and overall experience of students. This study found that perceived usability in terms of TAM and SUS increases the students' overall experience and their intention to recommend the online learning platform to others.

Keywords: *Perceived usability, System Usability Scale, Technology Acceptance Model*

Introduction

The COVID-19 pandemic has had a significant impact on all sorts of learning institutions across the world, ranging from kindergartens to schools, colleges, and universities. Educational institutions were forced to close during the COVID-19 outbreak, creating widespread disruption in the educational system. To stop the virus from spreading by flattening the "growth curve", rigorous social distancing measures have been implemented across the world, resulting in the physical shutdown of all sorts of learning institutions. As a result, educational establishments throughout the world have been compelled to adopt a "online only" exclusivity model for teaching and learning.

Information and communications technology (ICT) has been widely utilised in educational settings to transmit information for teaching and learning, and e-learning has emerged as a modern educational paradigm (Sun et al., 2008). Multiple information systems, services, and technologies are used in e-learning. Information system refers to both information service and information technology (IT), with service referring to the application of IT. Furthermore, not only the technical but also the social elements of the user experience and usability of information technology and services impact the e-learning process (Nakamura et al., 2017). Given the recent events surrounding COVID-19 and the global quarantine situation, e-learning has become increasingly essential as one of the best educational alternatives (Radha et al., 2020).

The term "usability" refers to the quality of a user interface. It's one of the most important considerations in interaction system design. Usability, according to The International Standards Organization (ISO-9241), is the limit of a user's effectiveness, efficiency, and contentment with the use of a system to achieve a certain objective. The adoption and efficacy of e-learning systems are heavily influenced by usability. Students will spend time growing familiar with system functions at the price of learning if usability is poor (Costabile et al. 2005). However, designers have a difficulty in making e-learning systems usable (Ardito et al., 2004), and it has been demonstrated to have a significant influence on students.

The usability challenge that has been the emphasis in the context of e-Learning is how to get students interested with the system and how to get them to interact with it (Ssemugabi & de Villiers, 2010). The technique of usability evaluation in e-Learning is all about the usability elements itself, which are supplemented by the

interface design idea, pedagogical efficacy, learning material, and the number of supports that learners may earn. As a result, usability testing in an e-Learning system should concentrate on the processes that the system supports. It differs from traditional task-based usability, which focuses solely on the end outcome of user-system interaction (Ssemugabi & de Villiers, 2010).

Research problem

Today's students are not all equipped with the same digital tools and technology, resulting in a digital divide (Iivari, Sharma, & Olkkonen, 2020). A number of existing studies have addressed and explored the digital gap that exists, particularly in relation to access to newer gadgets and technology (Song, Wang, & Bergmann, 2020; Srivastava & Shainesh, 2015), although awareness among young students is limited (Iivari, Kinnula, Juustila, & Kuure, 2018; Marien & Prodnik, 2014).

Furthermore, assessing the perceived utility of this sort of learning environment and scenario has never been done before, making it a difficult task. In addition, existing research ignores the digital divide, which may have an impact on the quality of online learning. This is to be expected, as institutions' use of online learning techniques has been secondary to increasing student performance to until (Abrami, Bernard, Bures, Borokhovski, & Tamim, 2011). However, given the changing conditions, where online learning has become the main and major way of delivering education, it is necessary to study the impact of the digital divide on the learning process' quality. As a result, objectives of this study are (a) To determine the level of perceived usability by using TAM and SUS and (b) To examine the impact of TAM factors (Perceived usability & Perceived ease of use) and SUS on recommendation intention and overall experience.

Literature review

Evaluation of an online learning platform in terms of usability and overall experience is a critical problem, especially in the current COVID-19 situation, which is characterised by the physical closure of all sorts of educational institutions. This section presents the framework of previous literatures on perceived usability in terms of TAM and SUS.

The Technology Acceptance Model (TAM)

TAM is one of the most popular and extensively used models for forecasting future utilisation of a product or technology among IS experts. The degree to which a person feels that employing technology will improve his or her work performance is referred to as Perceived Usability (PU) in the TAM context (Davis, 1989). Perceived Ease of Use (PEU), on the other hand, is defined as the degree to which a person feels that utilising technology would be simple and painless (Davis, 1989). TAM, on the other hand, considers the notions of PU and PEU as pre-usage factors, that is, before utilising any product or technology. TAM has been utilised as a study framework with external variables in a number of situations since its creation, including social networks, e-commerce, online gaming, healthcare, and others (Karahanna, Agarwal, & Angst, 2006; Teo, Ursavas, & Bahcekapili, 2012; Ursavas, 2013). Although numerous external factors have been included in various TAM adaptations, two variables (PU and PEU) stand out as the most often used.

The System Usability Scale (SUS)

SUS is one of the most often used tools for measuring perceived usability by HCI researchers, both in usability-related studies and surveys (Lewis, 2014, 2018). The popularity of SUS, and therefore our choice to include it in this study, can be attributed to a variety of factors. First and foremost, it is free to use and has been in the public domain for a long time. Second, it possesses excellent psychometric characteristics. Third, SUS has been the subject of significant normative study, which has resulted in a variety of interpretations (Bangor, Kortum, & Miller, 2009; Sauro & Lewis, 2016).

Revythi and Tselios (2019) utilise a mix of TAM and SUS to assess the acceptability of a learning management system. Instead of utilising the PEU component of TAM to measure the model, they used SUS instead. However, no information is given about how effective SUS is as a replacement for TAM's PEU component or whether they measure the same thing. Meanwhile, Pereira and Anamaria (2012) evaluated a Moodle-based learning platform using three different approaches (including SUS) and found that SUS is an excellent instrument for gauging usability. They did not, however, provide a SUS usability score. Using the SUS instrument, Ayad and Rigas (2010) compared a gamified vs. non-gamified virtual classroom and found that the game-based platform had higher performance and perceived usefulness. Orfanou, Tselios, and Katsanos (2015)

conducted a similar study in which they used SUS to evaluate an online learning platform and validated the SUS questionnaire for their learning management system platform. Sami, Rutter, and Smith (2016) assess a Moodle-based learning management system, looking for a link between SUS ratings and factors including age, IT capabilities, past experience with learning management systems, and usage frequency. The results reveal a link between SUS scores and the frequency with which the learning management system is used.

According to a search of the related literature, certain publications (Basilaia & Kvavadze, 2020; Reimers et al., 2020) and some web sites report on the state of education during the COVID-19, the need for meeting solutions, and solely videoconferencing difficulties (e.g., Basilaia & Kvavadze, 2020; Levinsen et al., 2013; Orngreen & Mouritzen, 2013; Weitze et al., 2013). Khalid and Hossan (2017) presented a case study of summative and empirical usability testing techniques for a specialised Video Conference System in university courses. However, the Zoom and Webex technologies were not examined in this study, and user experience was not considered.

In the framework of the COVID-19 pandemic, Correia et al. (2020) present the evaluation of Zoom, Skype, Microsoft Teams, and WhatsApp. They employed the Quality in Use Integrated Measurement (QUIM) methodology established by Seffah et al. (2006), to conduct an analytic assessment focusing on usability inspection. In addition, Singh and Soumya (2020) provide an updated comparison of Zoom, Microsoft Teams, Google Meet, Webex Teams, and GoToMeetings, although their study does not contain any usability or UX review. Finally, Pal and Vanijja (2020) discuss their work using TAM to assess the usability of Microsoft Teams (Davis, 1989). They do not include a Zoom or Webex assessment.

Likelihood to recommend and overall experience

As previously stated, because the COVID-19 scenario has forced a shift in focus to a "online only" mode of education delivery, perceived usability is a critical factor, and students must be satisfied after using the online learning platform in order for the teaching learning process to be effective. As a result, this study considers two additional measures which are (a) likelihood of recommendation and (b) overall experience with the learning platform and see if either TAM or SUS components can predict these two measures.

Reichheld proposed the likelihood to recommend (LR) as a popular technique of assessing user happiness and loyalty (2003). He named it the Net Promoter Score (NPS), and it's been used to measure customer happiness in a variety of situations since then (Lee, 2018; Owen, 2018). One of the reasons for its appeal is that it is relatively basic (just one question) and provides companies with timely data (Reichheld, 2003).

Users create an opinion on their overall experience (OE) with a product after using it. A positive experience is critical to the product's long-term sustainability. "Considering everything, how would you evaluate your entire experience with this product?" is one of the most popular and extensively utilised techniques of gathering such a view.

Methodology

Choice of Online learning platform

The Zoom application was chosen as the reference online learning platform for data gathering. The choice to use this application was made for the reasons listed below. Zoom is a cloud-based multiplatform meeting solution for video and audio conferencing, collaboration, chats, and webinars that can be used on computers (desktops, laptops), mobile devices, and phones. Chatting, screen sharing, annotating, whiteboarding, polling, breakout rooms, raising the hand, and controlling participants are just a few of the features that make it ideal for building engaging virtual hybrid classes and project collaboration. The ability to record sessions is available to users.

Research design

Research design is the strategy, plan and structure of conducting a research project (Leedy, 1993). This research involves exploring the answers for research questions. Hence researcher applied quantitative methodology for this study. Thus, survey method has been adopted. Constructs of this study are well defined and measurable. Therefore, this study employed quantitative methodology.

As discussed in the literature review section, perceived usability of online learning platform was measured by using TAM and SUS models. 12 items for TAM and 10 items for SUS were used to design the survey of this study. In addition, two direct items (one for likelihood to recommend and another one for overall experience) were incorporated in the study. All these items were adopted and modified from Pal and Vanijja (2020). The respondents gave their ratings on a 5-point Likert scale from 1 – *strongly disagree* to 5 – *strongly agree*. After

finishing the research variable section in the survey there was a general section wherein the participants were asked to fill some of their demographic profiles.

Currently, school and university students are engaging with online learning activities. Hence, target population of this study was students (school and university) who are engaging with online learning using Zoom application. Survey was designed using Google form platform and distributed among students via social media to reach them. As a result, data were collected from 150 students and analysed using SPSS (version 27) software to produce results.

Findings

To begin, Table 1 lists the demographics of the participants. Initially, the survey was disseminated through social media. As a consequence, for the purposes of study, 150 recorded replies were taken into account.

Table 1: Frequency Distribution of Demographic profile (N=150 respondents)

Demographic variables	Category	Frequency	Percentage
Gender	Female	66	44.0%
	Male	84	56.0%
Residential area	Urban	83	55.3%
	Rural	67	44.7%
Usage device	Smartphone	93	62.0%
	Laptop	53	35.3%
	Desktop computer	2	1.3%
	Tablet (Tab)	2	1.3%

According to the Table 1, 44% of students are female while 56% of the students are male out of 150 students. Hence the above half percentage of respondents are male. As stated in table, the majority of (55.3%) respondents are in urban area and other 44.7% from rural residential area. Usage devices for online learning are displayed in terms of smartphones, laptops, desktop computers and tabs. According to the Table 1, 62% of students are using smartphones for the online learning purpose. Followed by 35.3% of students are using laptops. Desktop computer and tablet are accounted for each only 2%.

The level of perceived usability by using TAM and SUS

Table 2 display the results of descriptive statistic of study variables. Mean scores and Standard Deviation of individual variable are considered to determine the level.

Table 2: Mean score and Standard Deviation of variables (N=150 respondents)

Variables	Mean	Standard Deviation
Perceived Usefulness (PU)	3.52	.65
Perceived ease of use (PEU)	3.70	.62
Technology acceptance model (TAM)	3.61	.61
System usability scale (SUS)	3.48	.63
Likelihood to recommend (LR)	3.55	.71
Overall Experience (OE)	3.65	.68

Technology acceptance model was measured with two dimensions namely perceived usefulness and perceived ease of use. PU was measured by 6 items. The mean score of PU is 3.52 with standard deviation 0.65. Meanwhile, 6 items were used to measure PEU. The means score and standard deviation of PEU are 3.7 and 0.62 respectively. As per the decision criteria, both dimensions of TAM show high level mean score. Hence the overall mean score of TAM (3.61) is at high level with standard deviation 0.61. It shows the students perceived usefulness of Zoom application from TAM perspective.

As stated in literature review, 10 items were used to measure SUS. According to Table 2, mean value of SUS is 3.48 with standard deviation 0.63. This result reveals that student's perceived usage of Zoom application is at moderate level in terms of System usability scale. In addition, recommendation intension and overall experience

show the mean value 3.55 (SD=0.71) and 3.65 (SD=0.68) respectively. This result reveal that recommendation intension and overall experience of students who use the Zoom application for online learning purpose is at high level.

The impact of TAM factors (PU & PEU) and SUS on recommendation intention and overall experience.

A regression analysis is conducted taking likelihood to recommend and overall experience as the dependent variables under the following conditions: (a) predicting LR and OE with PU and PEU (b) predicting LR and OE with TAM and SUS. Table 3 presents the results of the regression analysis.

Table 3: Impact of TAM factors (PU & PEU) and SUS on LR and OE

Predicting	Predictors	R-square	Regression weights		Significance (p value)	
			β_1	β_2	P1	P2
LR	PU and PEU	0.725	0.522	0.473	0.001	0.001
OE	PU and PEU	0.789	0.420	0.572	0.001	0.001
LR	TAM and SUS	0.790	0.392	0.653	0.001	0.001
OE	TAM and SUS	0.892	0.264	0.068	0.001	0.001

Likelihood to recommend (LR), Overall Experience (OE), Perceived Usefulness (PU), Perceived ease of use (PEU), Technology acceptance model (TAM), System usability scale (SUS), First Predictor (P1) and Second predictor (P2)

Note: The β weights are for the predictors in order. For e.g. in the first row 0.522 and 0.473 represent the weights for PU and PEU respectively while predicting LTR. P1 and P2 display the significant value of PU and PEU respectively.

The results show that PU and PEU account for around 72.5% of the variance in LR with a 95% confidence interval, and the β coefficients are significant for the predictors. Coefficients values of PU and PEU are 0.522 and 0.473 respectively. Meanwhile, 78.9% of the variation in overall experience is explained by both PU and PEU. Table 3 indicates that the significant value of both predictors (PU and PEU) is less than 0.05. Hence, it can be concluded that there is a significant impact of independent variables (PU and PEU) on the dependent variable (LR and OE). The variation on OE is high when compare with the variation of LR.

The results show that TAM and SUS account for around 79% of the variance in LR with a 95% confidence interval, and the β coefficients are significant for the predictors. Coefficients values of TAM and SUS are 0.392 and 0.653 respectively. Meanwhile, 89.2% of the variation in overall experience is explained by both TAM and SUS. Table 3 indicates that the significant value of both predictors (TAM and SUS) is less than 0.05. Hence, it can be concluded that there is a significant impact of independent variables (TAM and SUS) on the dependent variable (LR and OE). The variation on OE is high when compare with the variation on LR.

Conclusion

Given the current global COVID-19 epidemic, it is critical to undertake a usability evaluation of commonly used technologies for online education delivery, especially because the education delivery mode has moved to "online exclusively." As a result, the usability of learning technologies has become an essential factor in ensuring that online learning is successful and beneficial for students. The perceived usefulness of an online learning platform was examined in this study using the Zoom application as a reference.

One of the aim of this study was to measure the level of perceived usability of Zoom application for learning purposes from both TAM and SUS perspective. The study results reveal that perceived usability of online learning platform is at high level in both TAM and SUS perspective. In addition, students' intention to recommend the application (to others) and their (students) overall experience is high. Findings of this study aligned with the previous study by Pal and Vanijja (2020) who also found the same results.

Second aim of this study was to measure the impact of TAM factors (PU & PEU) and SUS on Student's recommendation intention and overall experience of online learning platform. Results reveals that PU and PEU has the significant impact on both LR and OE. Notably, impact of PU and PEU on OE is high comparing with the impact on LR. This results match with Maniar et al. (2007). Furthermore, significant impact of TAM and SUS on both LR and OE was revealed through the findings. It is pointed that perceived usability in terms of TAM and SUS increases the students' overall experience and their intention to recommend the online learning platform to others. This finding aligns with similar fining of extant literatures (Kortum & Johnson, 2013; McLellan et al., 2012; Pal & Vanijja, 2020).

The Zoom application was solely used as a benchmark for assessing the perceived usability of online learning systems. Although this study offered explanations for this option, it would be preferable to explore other popular learning tools such as Microsoft Teams and Google Classroom in future research. In general, online learning is a complex scenario involving multiple factors such as the quality of the course materials, the quality of the video lectures, the level of support provided by the system, the user interface design of the learning system, interactivity, and learnability, all of which can influence their use (Junus, Santoso, Isal, & Utomo, 2015). The current work aims to capture a tiny element of the total user experience, but future research may focus on the wide user experience aspect.

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