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Continued usage intentions of digital technologies post-pandemic through the Expectation-Confirmation Model: the case of a Tanzanian university

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ABSTRACT

This paper explores the intentions of faculty to continue to use digital technologies post-pandemic in a specific institutional context. To do this, this study adapted the Expectation-Confirmation Model to investigate instructors' continuance usage intentions of digital technologies in enhancing teaching activities at a prestigious university in Tanzania. The study employed a mixed sequential explanatory design, and the findings show that perceived usefulness and satisfaction are two factors that motivate instructors' continuance usage intentions. The findings of this study suggest that despite the significant exposure to digital technologies both prior to and during the pandemic, continued use of digital technologies in teaching is still defined by pragmatic concerns. These concerns are themselves complex intersections of intent, identity, and emergent practice, coupled with structural issues related to access, cost, and know-how. These findings indicate the need for digital training, accreditation, and localised content that has linkages to the lived experiences of teachers in the Tanzanian context; that mitigates the barriers to participation that many experience (largely around data costs and connectivity); and that emerges from a participatory and incentivized model. We believe such findings are applicable well beyond the scope of this institution, particularly for those institutions looking to develop context-specific digital training for teaching staff.

Keywords: *digital education; teacher training; Tanzania; Moodle; expectation-confirmation model*

INTRODUCTION

In the past decade, universities in Africa have been investing heavily in various digital technologies to improve the quality of teaching and learning and widen access to education through blended and distance learning (Araka et al. 2021). Indicative of this, learning management systems (LMS), such as Moodle, Blackboard, and Sakai have been adopted with Moodle being the most popular (Bervell & Umar 2018). The LMS offers several benefits such as ease of course delivery electronically, access to learning materials (Tagoe & Cole 2020) and providing easy communication between instructors and students synchronously and asynchronously (Naveh et al. 2010). They also provide online access to assignments, discussions, assessment and grade books, registration, and transcripts, (Vovides et al. 2007). Use of an LMS has been positioned as a means of modernising learning material; improving learning outcomes; and enhancing student engagement (Mncube 2019). Potentially, the LMS provides a mechanism for allowing universities to move their teaching online or into blended modes, as well as make that movement a relatively uniform experience for teachers and students. That potential is often muted, however, by a range of issues including a lack of awareness, the availability of training (Helmi et al. 2021), sufficient connectivity and technological access (Kooli 2021), and, in some instances, a lack of institutional support.

With the emergency of the COVID-19 pandemic, video conferencing applications such as Zoom, Skype, GoToMeeting, and Adobe Connect have been widely used to facilitate online teaching, replacing face-to-face delivery (Adedoyin & Soykan 2020; Kooli 2021). These video conferencing

facilities have also been used to conduct meetings and postgraduate presentations. Other digital technologies and online resources that have been adopted during the COVID-19 pandemic, include open educational resources and social media technologies. Universities have been adopting these technologies to continue with teaching activities while reducing face to face contacts in a bid to keep staff and students safe from COVID-19 (Ray & Srivastava 2020; Helmi et al. 2021).

It is expected that the adoption of digital technologies will increase significantly during and post pandemic especially in Africa. In fact, even before the COVID-19 pandemic was declared, it was predicted that there would be a 15% increase in the digital technologies adoption growth rate per annum in Africa between 2011 and 2016 (Adkins 2013). However, the digital technologies adoption rate increase was 0.9% between 2011 and 2016 (Adkins 2016). The discrepancies between these two rates of growth deserve further scrutiny.

In Tanzania, more than 70% of universities were found to have adopted various digital technologies (Matse & Raisamo 2014) with the number of courses using these technologies increasing significantly during the COVID-19 pandemic. For instance, at Kilimanjaro Christian Medical Centre the uptake of digital technologies increased by 15.4% with a 22.3% increase in the number of uploaded courses (Ibrahim et al. 2020). At Mzumbe University, the number of registered courses in digital technologies increased from 150 before COVID-19 to 421 during the pandemic and the number of users tripled (Ghasia et al. 2020). Similar growth rates are found in other universities throughout Tanzania.

Similarly, the university we focused on in this study started adopting digital technologies to enhance teaching and learning activities in 1998 when the Blackboard system was first introduced (Matse et al. 2011). Ten years later, the Blackboard system was replaced by Moodle. The replacement of Blackboard was accompanied by the introduction of three postgraduate blended programmes: Postgraduate Diploma in Education (PGDE), Postgraduate Diploma in Engineering Management (PGDEM), and the Master degree in Engineering Management (MEM) (Matse & Raphael 2013). Despite having the experience of using digital technologies as well as invested ICT infrastructure, the university was unable to offer its programmes online immediately *during* the COVID-19 pandemic as not all instructors were using digital technologies *before* the pandemic. Despite institutional capacity for digital instruction as a whole, there were significant gaps across schools and colleges in this regard, that the pandemic exposed.

Therefore, an audit of the infrastructure, digital technologies, and instructors' skills gap was conducted in June 2020. The audit recommended Moodle, the Postgraduate Information Management System (PGMIS), and Zoom conferencing applications as the key digital technologies that could be used to enhance teaching activities during the pandemic. This audit was followed by the training of 340 instructors to use these technologies. Given that some instructors were already using these technologies, the number of courses in Moodle and PGMIS increased by 50% after the training (Matse et al. 2021). Although the university reopened in June 2020, and regular face-to-face classes resumed, instructors have continued to use these digital technologies to complement face to face teaching and postgraduate student supervision.

Although the number of instructors increased significantly just after the training, it is important to investigate if these instructors have continued to use these technologies after adoption. It is common in African universities for instructors to stop using digital technologies or use relatively few features after initial adoption (Bagarukayo & Kalema 2015; Matse 2015; Ssekakubo et al. 2011; Unwin et al. 2010). A survey in South African Universities such as University of Cape Town, University of Stellenbosch, University of Western Cape, and the University of Johannesburg revealed that many instructors did not continue using the LMS after an initial adoption (Bagarukayo & Kalema 2015). This same trend was reported in Maseno University, Mount Kenya University, Kenyatta University, Cooperative University, and KCA University (Araka et al. 2021), Ghanian

University (Bervell & Umar 2018) and University of Technology (UoT) (Machika & Dolley 2018). In Tanzania, of the 841 instructors who were trained in using various digital technologies at the University of Dodoma, only 103 instructors were actively using the system by the end of 2014 (Matse & Raisamo 2014). Similarly, it was found that more than 60% of instructors who were trained to use the Moodle system at Mzumbe University stopped using the system a few months after the training (Almas et al. 2021). Therefore, the unwillingness to continue using digital technologies beyond the initial adoption stage is a common phenomenon, largely shared globally (Sørebø et al. 2009). Training, in and of itself, is not enough to ensure continued use.

Instructors' use of digital technologies in teaching activities has been studied extensively, but much of the research tends to focus on investigating the technology's adoption or its initial acceptance (San-Martín et al. 2020). Although initial acceptance is important in identifying the success of digital technologies, continued usage is even more significant in ensuring the long-term viability of technology innovations (Santhanamery & Ramayah 2014). Continuance usage implies that after the initial acceptance of digital technologies, instructors intend to continue using these technologies for teaching activities. As universities continue to spend significant amounts of resources to implement these technologies, devising measures to ensure that instructors continue using these technologies is critical to realising the aims of their use, in improving teaching and learning in Tanzanian higher education.

As such, this paper provides a study of a single institutional context trying to determine the impact of the pandemic on the continued use of digital technologies in teaching. It notes what factors directly influence that continued use around satisfaction and perceived usefulness, as well as the impact of institutional activity, such as co-created digital training and support. In this paper, we argue that the pandemic did not necessarily provide the momentum towards sustained use that many suggested. Rather, continued use of digital technologies cannot be subscribed to any one characteristic, but can be seen as a larger ensemble of actors working in tandem to create measures of sustained use. Institutional responses to this ensemble must account for the complex intersections of intent, identity, and emergent practice, coupled with structural issues related to access, cost, and know-how. To explore this, this study adapted the Expectation-Confirmation Model (ECM) to investigate instructors' continuance usage intentions of digital technologies in enhancing teaching activities at the university. Digital continuance refers to long-term or sustained use of technologies by instructors over a period (Bhattacherjee 2001).

Continued usage intentions and hypotheses development

It is widely believed that instructor use of digital technologies would lead to increased student interaction, improve the explanation of complex concepts, maintain students' attention, and make the teaching process more efficient (Jang & Tsai 2012; Kooli 2021). Such optimistic positions of digital technologies in education are increasingly being challenged. For instance, the use of digital technologies in teaching does not necessarily alleviate teachers' work and make teaching more 'efficient'; nor does technology on its own improve learning (Facer & Selwyn 2021). Yet, we posit that the lack of consistent engagement with digital technologies and the know-how that might be accrued as a result of that engagement are detrimental to institutions being able to fashion viable digital teaching approaches. In short, these benefits cannot be achieved if instructors are not continuously using digital technologies beyond the adoption stages (Karahanna et al. 1999).

In order to investigate instructor's continuance usage intentions at the university, the Expectation Confirmation Model (ECM) was adopted. The ECM has long been used to explain continuance intention of technologies in a variety of contexts (Wang & Wang 2019) and in e-learning settings (Sørebø et al. 2009). The model was developed by Bhattacherjee (2001) by adapting the Expectation Confirmation Theory (ECT) (Oliver 1980) widely used in consumer behavior research. According to Bhattacherjee (2001), users form an initial expectation about the technology prior to

usage. Following the first use, users form an expectation about its performance which they compare with their initial expectations. Users then determine their level of satisfaction based on their confirmation level, and the expectation on which that confirmation was derived. Finally, satisfied users engage in re-use of the technology while dissatisfied ones cease to use it (Venkatesh et al. 2011). In summary, an individual's intention to continue technology usage is dependent on three variables: the user's level of satisfaction, the extent of the user's confirmation of expectations; and post-adoption expectations, in the form of perceived usefulness. Figure 1 below illustrates the relationship of the three variables in the ECM towards continuance intention of technology.

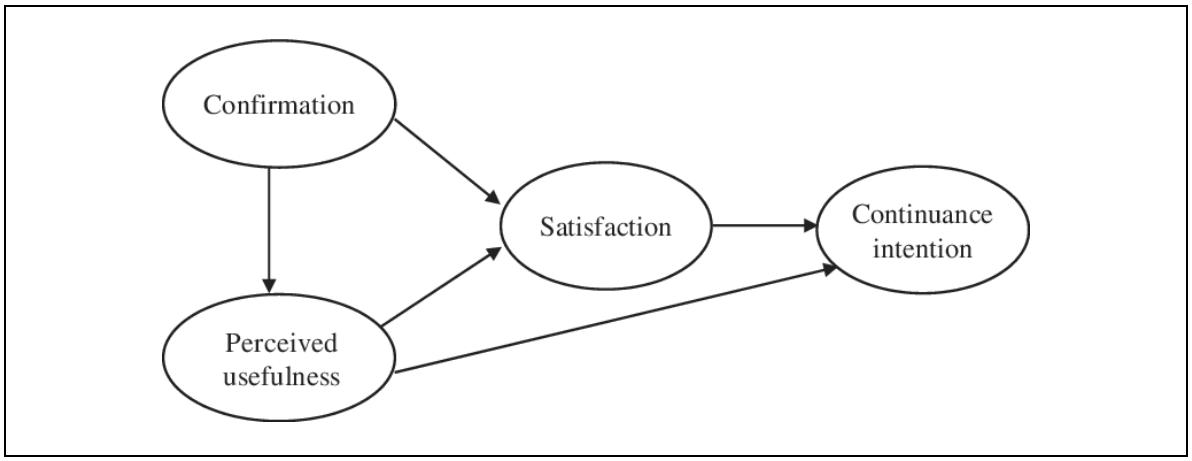

Figure 1: The Expectation-Confirmation Model (Bhattacherjee, 2001),

The study adopts ECM in examining the instructors' continuance intentions of digital technologies at the university. Bhattacherjee (2001) states that confirmation is associated with the process of comparing users' pre-expectations with his or her actual experiences. Oliver (1980) states that users' confirmation level positively influences their satisfaction with the product or service. Based on ECM, we propose that the instructors' confirmation level will positively affect satisfaction in digital technologies. This is to say, instructors will be more satisfied when their confirmation is high. In contrast, if the confirmation is negative, this results in a decrease in post-adoption satisfaction (Bøe et al. 2020; Hadji & Degoulet 2016). In our study, we assume that if the instructors' experience confirms their expectations from using digital technologies, satisfaction will emerge. Thus, we propose:

H1: Confirmation has an effect on instructors' satisfaction towards digital technologies.

The ECM also posits that the users' confirmation of expectations will have a positive effect on the perceived usefulness of digital technologies (Bhattacherjee 2001). In this context, instructors tend to rate digital technologies as being more valuable when their expectation is confirmed during use. Instructors' performance-expectation in digital technologies includes helping to conduct teaching activities easily and efficiently. Several studies have found that perceived usefulness was determined by confirmation in the educational technology environment (Ashrafi et al. 2020; Junjie 2017). Thus, the proposed hypothesis for this factor is:

H2: Confirmation has an effect on instructors' perceived usefulness towards digital technologies.

Perceived usefulness was also adapted as a key factor in this study. It is defined as the degree to which a user believes that using an application will enhance job performance (Davis et al. 1989).

This is to say, if technology does not help users to achieve their goals, there is little chance that they will perceive the system as useful (Seddon & Kiew 1995). In this study, perceived usefulness relates to the degree to which instructors believe that using digital technologies will improve their ability to facilitate teaching activities. Several studies have found that perceived usefulness has an effect on user satisfaction of various digital technologies in an overall learning environment (Ashrafi et al. 2020; Bøe et al. 2020; Cheng 2014). As such, the proposed hypothesis for this factor is:

> H3: Perceived usefulness has an effect on instructors' satisfaction towards digital technologies.

Similarly, (Bhattacherjee 2001) observed that the perceived usefulness of technology is the driving force for people to adopt or use it in the future. This is to say, instructors' appreciation in a post adoption situation will be determined by digital technologies usage experience and will likely have a positive impact on continuance usage intention. Studies such as Adedoyin & Soykan (2020), Ashrafi et al. (2020), Cheng (2014), and Junjie (2017) found that perceived usefulness was the most influential antecedent of users' continuance intention towards digital technology. Thus, the proposed hypothesis is:

> H4: Perceived usefulness has an effect on instructors' continuance intention towards digital technologies.

User satisfaction was also adopted as a key factor towards investigating instructors' continuance usage intentions. It is defined as an affective attitude towards a specific technology by someone who interacts with it directly (Doll & Torkzadeh 1988). According to the ECM, intention to continue using the technology is mainly based on satisfaction with prior technology usage (Bhattacherjee 2001). In general, instructors with high levels of satisfaction are likely to use digital technologies more often than dissatisfied ones (Baroudi et al. 1986). Here, we believe that feeling satisfied would be the driving force behind instructors' continuance intention of digital technologies. Therefore, it is proposed:

> H5: Satisfaction has effect on instructors' continuance intention towards digital technologies.

Finally, the continuance intention is regarded as a dependent variable in ECM. It refers to long-term or sustained use of digital technology by individual instructors over a period of time (Bhattacherjee 2001). It is determined by the users' satisfaction which is jointly influenced by confirmation and perceived usefulness (Santhanamery & Ramayah 2014).

METHODOLOGY

The study employed a mixed sequential explanatory design whereby quantitative data were collected via a questionnaire. Following analysis of the quantitative data, interviews were conducted with select faculty at the host institution to collect the qualitative data.

Mail questionnaires were distributed to 500 instructors from 16 colleges and schools at the host university. Since our main concern at that time was understanding continuance usage of the digital technologies, only registered instructors in core university supported technologies such as the Moodle system and PGMIS were included in June 2021. In order to estimate the minimum sample size required for this study, a formula by Green (1991) was adopted. The formula states that N >50+8m where *m* is the number of variables (factors). The proposed model in this study has 4 factors, so using *Green's* method a *sample* of > 50 + 8x4= 82 participants. Of 500 instructors who were emailed the data collection instrument, 152 completed the instrument, 69% were male, while

31% were female. Therefore, the sample size met the required number of respondents, as suggested by Green (1991).

In this study, the target digital technologies were the Moodle system, the video conferencing system, and the Postgraduate Information Management System (PGMIS). These systems were identified during an audit as information systems that could be quickly adopted to deliver various courses during the COVID-19 crisis (Matse et al. 2021). In addition, nearly 400 instructors were trained on these systems at the beginning of the COVID-19 crisis at the university, which suggests some familiarity with these technologies.

Data Collection instrument

The questionnaire used a 5 item Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) with a follow-up question for each answer. The questions were adapted from the IS-continuation model by Bhattacherjee (2001). The items used to operationalize the variables in this study were modified with a few changes in wording reflecting the digital technologies targeted in our setting and the specific user context. The items in the instrument are presented in Table 1 below.

Table 1: *The items for each factor*

Factor	Code	Item
Confirmation	C1	My experience with using digital technologies was better than what I expected.
	C2	The service level provided by digital technologies was better than what I expected.
	C3	Overall, most of my expectations from using digital technologies were confirmed.
	C4	Digital technologies can meet demands in excess of what I required for teaching activities.
Perceived usefulness	PU1	I find the digital technologies useful in the process of teaching and learning.
	PU2	Using the digital technologies enables me to conduct teaching activities more quickly.
	PU3	Using digital technologies improves my performance in teaching activities.
	PU4	Using digital technologies enhances my effectiveness in managing teaching activities
Satisfaction	S1	Digital technologies have met my expectations in enhancing teaching and learning activities.
	S2	Digital technologies adequately meet my needs of interacting with the students.
	S3	Digital technologies are efficient in fulfilling my needs of interaction with my students.
	S3	Overall, my interaction with the digital technologies is very satisfying.
Continuance intention	CI1	I intend to continue using digital technologies rather than discontinue its use.
	CI2	My intentions are to continue using digital technologies than use any alternative means (face to face teaching)
	CI3	If I could, I would like to discontinue my use of digital technologies.

The scale labels used in the study were: 1 – *strongly disagree*, 2 – *disagree*, 3 – *neither agree nor disagree*, 4 – *agree*, 5 – *strongly agree.*

FINDINGS

Video Conferencing applications

At the beginning of the COVID-19 pandemic, instructors were at least nominally equipped with the necessary skills to be able to use the Zoom video conferencing application to facilitate online teaching, replacing face-to-face delivery. It was also expected that instructors would use Zoom for meetings and for students to present their research work without having to come physically to the university campus. Nonetheless, some instructors had the necessary skills to use video conferencing applications other than Zoom and preferred to continue using them. Therefore, in this study we wanted to identify which video conferencing application instructors mainly use.

Among the instructors that completed the data collection instrument, 85% indicated that they use Zoom followed by Skype (37%) while GoToMeeting was found to be the least used video conferencing application. In addition, we wanted to understand how often instructors use these video conferencing applications. More than half (57%) of instructors indicated they use them rarely while only 10% use them all the time as shown in Figure 2.

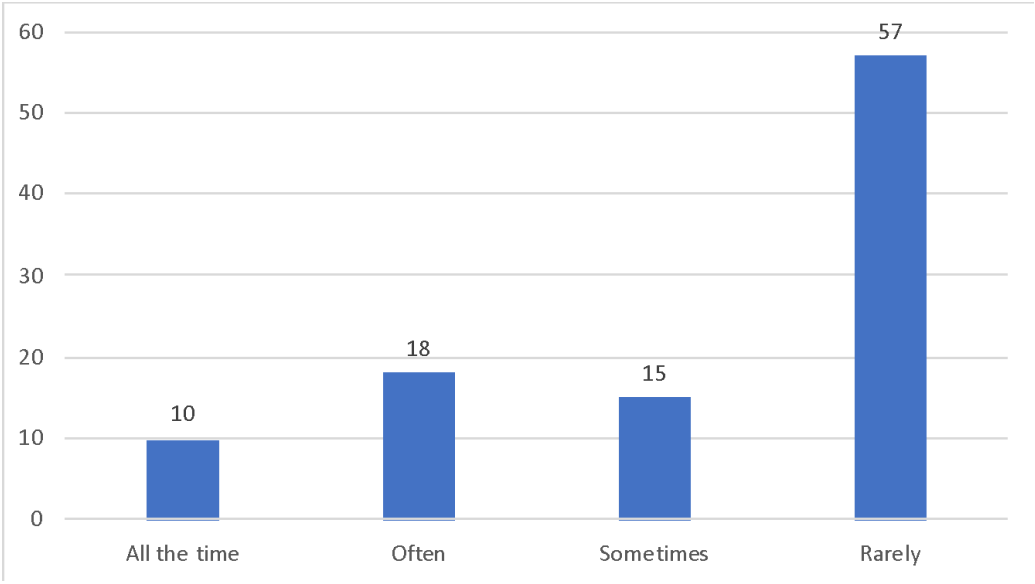

Figure *2*: Percentage of instructors' usage of Video Conferencing applications

During the interview with selected instructors, it was found that the majority of instructors use video conferencing applications for conducting and participating in various meetings which were previously conducted face to face.

In addition, some instructors, especially those teaching postgraduate courses, have been replacing face to face teaching with video conferencing facilities. One instructor at the university noted the following:

> *I used Zoom at least once per month for conducting meetings with colleagues from outside Tanzania. Since COVID-19 pandemic arrived, I have been using for Zoom for teaching my masters students once per week. The number of meetings that use Zoom or other video conferencing facilities have increased significantly. We conduct the majority of our meetings online nowadays.*

Another faculty member was keen to point out the possible 'efficiency' generated in such a move into these video conference applications.

> *Most of the time, I use a video conferencing application for the meetings. Because it helps me to participate in any meeting anytime, anywhere. Also, it helps to cut some of the movements from the office or home to the place where the meeting takes place.*

However, it was noted that some instructors found it difficult to use video conferencing applications for teaching activities due to large classes, as suggested below.

> *I have been using Zoom to teach postgraduate students. It is easier as there are only 20-40 students. I tried to use Zoom for an undergraduate class with 250 students, it was very difficult as I could not manage the class. I stopped.*

In much of the data, there is reference to this scaling issue suggested by the participant above, and the suitability of such video conferencing applications for instruction is largely predicated on class size.

The use of Moodle and PGMIS

The University adopted Moodle as the main Learning Management System in 2007 (Matse et al. 2011). Initially, the system was used to offer blended programmes: Postgraduate Diploma in Education (PGDE), Postgraduate Diploma in Engineering Management (PGDEM), and the Master degree in Engineering Management (MEM). Later, the University encouraged instructors to use the system to complement face to face teaching by sharing the learning resources with students while conducting lectures in face to face mode.

The PGMIS was developed in 2019 to help instructors in managing students' supervision activities including assigning supervisors, scheduling presentations of proposals to dissertation/thesis, recording minutes, and generating reports for graduation. The system was implemented at the College of Information and Communication Technologies (CoICT) and the College of Natural and Applied Science (CoNAS), with 261 instructors and 1,283 postgraduate students.

Although the two systems were implemented pre-pandemic, not all instructors had the required skills to use the majority of these systems' features during the COVID-19 pandemic. Training was conducted in June 2020 with nearly 400 instructors in order to ensure that the majority of them have the necessary skills to use these systems effectively, to facilitate teaching and learning during the COVID-19 pandemic.

Combined with those who were trained and those who were using these systems before, it was important to understand the extent to which instructors use them. It was revealed that nearly half (53%) indicated that they use the Moodle LMS often or all the time. The minority of instructors (26%) rarely use the Moodle system. It was also revealed that most instructors (71%) rarely use the PGMIS while few of them (4%) use the system to facilitate students' supervision activities. The percentage distribution for use of Moodle and PGMIS during the pandemic is shown in Figure 3 below.

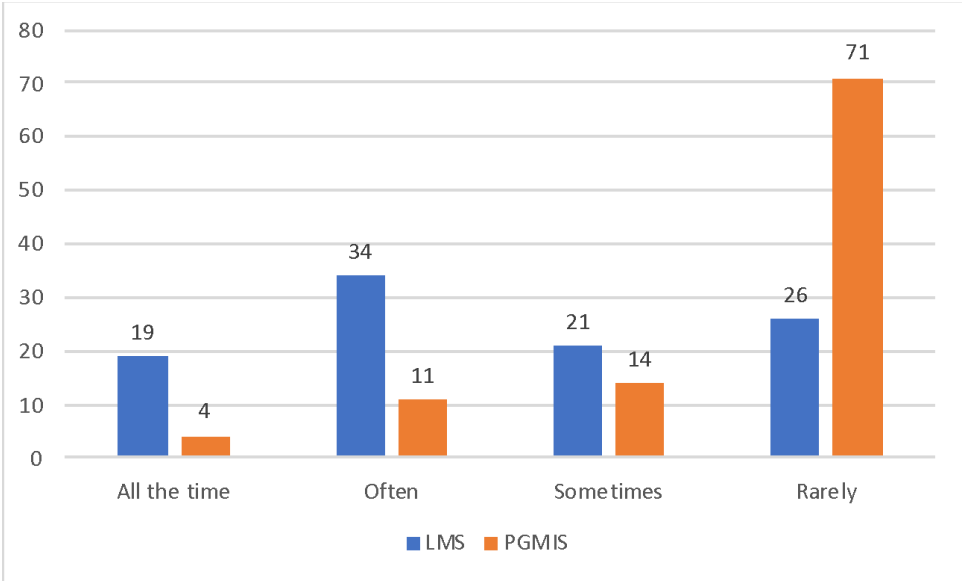

Figure *3*: Percentage of instructors' usage of Moodle LMS and PGMIS

During the interviews with selected instructors, many of them indicated that they use Moodle to share learning resources with students. In many cases, the PowerPoint presentations, lecture notes, and resources from the Internet are downloaded and shared with students via Moodle. Some of the instructors' comments are noted below:

> *For me, uploading notes enables me to share materials with students. These might be articles and PowerPoint presentations. Assignments allow the teacher to assess students and get feedback about a topic.*

> *I use materials from the Internet and share them with students in Moodle, for example, PowerPoint presentations. In addition, In case I find a good video from YouTube I share with students via the Moodle system, I just put a link.*

It was also noted that among those with large classes, the quiz and assignment are the preferred features that enable instructors to administer assessment easily, compared to the face to face approach of using paper-based assessments. For instance, one instructor commented:

> *Quizzes and assignment administration are simplified due to the huge number of students. I do not need to mark; the system marks automatically, so with my 400 students, I can set a quiz, and within a short time, I have all the marks from the system.*

The interview data, in large part, supported the data emerging from the survey: awareness of the functionality involved in the supported digital technologies and how that functionality might support teaching, led in many instances to sustained use. The size of the course being taught surfaced with particular digital technologies (Moodle as in the assessment comment above) over others (Zoom being less suitable to large classes).

Measurement model results

Cronbach's alpha was used to measure the instruments' reliability, and it was found to be 0.853 for 13 items. The results show that the instrument was reliable as the value of Cronbach's Alpha was

above 0.5 (Hair et al., 2006). In addition, factor analysis was performed using the principal component analysis extraction method on the 13 items using direct oblimin rotation with Kaiser normalization. The factor analysis aimed to show whether the related items were clustered under the same construct or not. The minimum factor loadings should be .300 (Hair et al., 2006). Taking as reference this acceptance criterion, C3 was eliminated. Table 2 shows the Cronbach's alpha coefficients for construct reliability measurement and the loadings per item.

Table 2: *Cronbach's alpha coefficients and the loadings per item*

Constructs and measurement items	**Loadings**	**Cronbach's alpha**
Confirmation		.849
C1	.897	
C2	.842	
C3	.045	
C4	.852	
Perceived usefulness		.847
PU1	.548	
PU2	.610	
PU3	.930	
PU	.829	
Satisfaction		.871
S1	-.760	
S2	-.921	
S3	-.849	
S4	-.608	
Continuance intention		.870
CI1	.714	
CI2	.938	
CI3	.923	

Research models

R2 represents the amount of explained variance of each endogenous latent variable. It indicates the predictive power of the model. The constructs returned R2 values between 0.174 and 0.421 as shown in Table 3, therefore, they are within desirable ranges, and the constructs possess an acceptable predictive power quality (Chin, 1998).

Table 3: *Summary of the research models*

	Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	Perceived usefulness	.421[a]	.177	.174	.90871499
2	Satisfaction	.651[a]	.424	.421	.76121520
3	Continuance intention	.586[a]	.344	.340	.81255423

Hypothesis testing

In testing the hypotheses, the beta values indicate the contribution by each factor in the research model, after performing regression analysis using SPSS. The finding in respect of each hypothesis, that is, whether the factor in question had a positive or negative impact, was determined to be significant when the finding had a p-value (calculated probability) of less than 0.05.

The results from this study showed that all hypotheses (H1-H5) were found to be having a significant impact, that is, their beta values were positive or negative, at p-values less than 0.05. Three hypotheses (H1, H3, and H5) were found to have a significant negative impact (their beta values were negative, at p-values less than 0.05) while two hypotheses (H2 and H4) have a significant positive impact (their beta values were positive, at p-values less than 0.05). A summary of beta values and p-values for the five hypotheses, as obtained from linear regression analysis is shown in Table 4.

Table 4: *Standardized regression coefficients*

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
Confirmation/ Satisfaction (H1)	-.227	.047	-.227	-4.819	.000
Confirmation/ Perceived usefulness (H2)	.421	.051	.421	8.239	.000
Perceived usefulness/ Satisfaction (H3)	-.522	.047	-.522	-11.085	.000
Perceived usefulness/ Continuance intention (H4)	.309	.058	.309	5.327	.000
Satisfaction/ Continuance intention (H5)	-.343	.058	-.343	-5.903	.000

The beta and p-values are shown in Table 5 below. As shown, all the hypotheses had significance, suggesting that satisfaction and perceived usefulness has an impact on the continuity of use.

Table 5: *A summary of hypothesis testing findings*

Hypothesis	**Results**
H1: Confirmation has an effect on instructors' satisfaction towards digital technologies.	Significant with negative effect (beta = -0.227, $p < 0.05$)
H2: Confirmation has an effect on instructors' perceived usefulness towards digital technologies.	Significant with positive effect (beta = 0.421, $p < 0.05$)
H3; Perceived usefulness has an effect on instructors' satisfaction toward digital technologies.	Significant with negative effect (beta = -0.522, $p < 0.05$)
H4: Perceived usefulness has affected instructors' continuance intention towards digital technologies.	Significant with positive effect (beta = 0.309, $p < 0.05$)
H5: Satisfaction has an effect on instructors' continuance intention towards digital technologies.	Significant with negative effect (beta = -0.343, $p < 0.05$)

Challenges facing usage of digital technologies

The results show that satisfaction and perceived usefulness are themselves inconclusive. As such, instructors were asked to indicate challenges they were facing when using digital technologies for teaching and learning during the pandemic. One of the main challenges described by the majority of instructors was related to the Internet. Instructors indicated that the Internet at the university campus was slow and unreliable. Conducting video conferencing classes using university Internet was difficult and even uploading large files into the Moodle or PGMIS was a challenge. Therefore, the majority of instructors had to use their own Internet connectivity. Some instructors complained about the cost of Internet connectivity from mobile firms as being too expensive to conduct video conferencing meetings. The following participant comment is instructive in this regard.

> *On average, I can spend almost TSH3,000 [approximately USD1.5) on the Internet if I have to conduct all my teaching activities using digital technologies. This is a lot of money for a lecture to spend outside the normal budget.*

The time needed to engage with technological support structures at the university proved problematic and likely contributed to both satisfaction and perceived usefulness. Instructors complained about the delays in responding to emails while phone calls were not answered. Some of the comments from respondents illustrate:

> *"When you report the problem, sometimes they tell you to wait as they are finding a way of helping you. Then I keep on waiting, and yet sometimes they do not come back to me. At that time I have students online and therefore I cannot proceed with my class".*

> *"The IT technical team does not have enough technical staff to support all instructors at the university. They used to organize training at the beginning of the semester, but with COVID-19 the number of instructors using Moodle and PGMIS has increased*

> *significantly. They do not have capacity to support challenges facing instructors in all 15 colleges. They need to find ways of training us even during the semester"*

It was found that most instructors were unable to use most of the digital technology features due to a lack of training, or a lack of awareness of what training exists at the institution that could help them learn how to use these features. It seems that the training that was conducted at the beginning of the pandemic was not sufficient to enable instructors to use the range of functionality available on Moodle and PGMIS in particular. For instance, in the words of some instructors:

> *I have never used Wiki, blog, or quiz features in the Moodle because I am unaware of these features. I have never been trained, I tried once to use a quiz, I found it complicated then I just left. So, I use Moodle mostly for sharing learning resources with my students.*

> *My opinion is that this system is good, but I ask for the Technical team to give us more training, as the system has many features which we cannot use properly. In the beginning, I had to spend time asking our friends who attended the second training how to [use the] quiz and assignment features. They were also struggling to use these features.*

This larger training and support apparatus at the university clearly is impacting the continued use of these technologies, particularly in the areas of satisfaction and perceived usefulness (in comparison to the effort necessary to learn the features of the technology).

DISCUSSION

This study adapted the Expectation-Confirmation Model (ECM) to evaluate instructors' continuance usage intentions of digital technologies in enhancing teaching activities at a university. The study employed the mixed sequential explanatory design whereby quantitative and qualitative data were collected and analyzed. A total of 152 instructors who use the Moodle system, video conferencing system, and the Postgraduate Information Management System (PGMIS) participated in the study. The five hypotheses derived from the five factors in the ECM—confirmation, perceived usefulness, satisfaction, and continuance usage intentions were subjected to linear regression analysis. The findings show that perceived usefulness and satisfaction are two factors that motivate instructors' continuance usage intention to use digital technologies in enhancing teaching and learning. This finding confirms previous studies such as Ashrafi et al. (2020), Bhattacherjee (2001), Hadji & Degoulet (2016), and Santhanamery & Ramayah (2014) which found that perceived usefulness and satisfaction are key factors towards continuance usage intention in various technologies.

According to Bhattacherjee (2001), perceived benefits are influenced by the confirmation of expectations. In this study, confirmation was a significant predictor of perceived usefulness (beta = 0.421, $p < 0.05$) explaining 17% of the usefulness variance. This shows that after the instructors started using digital technologies, they modified the previous expectations, gradually confirming that these technologies provide several benefits in enhancing teaching activities compared with face to face teaching. Some of the benefits pointed out by instructors during interviews include sharing learning resources with students easily, communicating with students anytime anywhere and conducting assessment while maintaining physical distance. Other benefits include organizing and participating in various meetings at any time anywhere while maintaining social distancing. Perceived usefulness was also found to be the driving force for users to use various technologies such as those in Adedoyin & Soykan (2020) and Junjie (2017). Therefore, it is important for the university to continue conducting instructor awareness of the usefulness of digital technologies in enhancing teaching activities.

Based on ECM, satisfaction is an important factor towards user continuance usage intentions of information systems. It is similar to the way satisfaction affects individuals' re-purchase and re-use of a product or service explained by Oliver (1980). In this study, confirmation (beta = -0.227, $p < 0.05$) and perceived usefulness (beta = -0.522, $p < 0.05$) were found to have significant negative effect on instructor's satisfaction explaining 42% of the satisfaction variance. This finding supports the contention in ECM that having satisfied users is the critical driver of continued digital technologies usage intention and thus an antidote against digital technologies usage discontinuance (Bhattacherjee 2001; Thong et al. 2006).

The relationship between confirmation and user satisfaction was assessed by Hypothesis H1. The relationship was significant but negative, indicating that instructors' satisfaction decreased with the use of digital technologies. This is to say, the experience of using the digital technologies did not exceed the expectation before use, leading to lower satisfaction with the actual use. Similarly, the relationship between perceived usefulness and user satisfaction was significant but negative. This finding shows that despite instructors having positive perceptions of the usefulness of digital technologies in enhancing teaching activities during the COVID-19 pandemic, their satisfaction decreased with digital technologies use.

The dissatisfaction of instructors on digital technologies usage could be due to three main reasons. First, instructors could be dissatisfied with technologies use due to inadequate knowledge for use of most features. It seems that the training conducted during the COVID-19 pandemic was short, covering few features of the technologies. For instance, it was found that technological content knowledge and technological pedagogical knowledge were partially covered during the training (Matse et al. 2021). In this case, instructors are unable to unlock the potential of digital technologies to improve students' learning compared to traditional face to face teaching. Bhattacherjee & Lin (2015) observed that using technologies for the first time requires overcoming significant learning barriers on the part of potential users. However, once that learning barrier is overcome, subsequent usage is not constrained by high learning barriers. It is important for the university to continue providing training on the new features to ensure that instructors use most of the features.

The findings from the interviews clearly showed that technical staff were overwhelmed with the number of instructors requesting both technical and pedagogical support during the pandemic. The lack of reliable support coupled with lack of intensive user training affected instructors' satisfaction with the digital technologies, as they could not use these technologies effectively. Therefore, it is recommended that additional support services should be sought to ensure that instructors use these technologies effectively and efficiently. Some of the support services that can be considered to complement existing channels include interactive demos, inquiry hotlines, virtual assistant video facilities, and click to call (Chan et al. 2020).

Finally, the decreased satisfaction of the instructors could be due to the challenges related to Internet connectivity faced by most instructors. The use of digital technologies depends on availability of devices and reliable Internet connectivity (Adedoyin & Soykan 2020). It was clear that many instructors had concerns about the reliability and the cost of the Internet in their usage of digital technologies. Alleviating these barriers, particularly regarding cost and connectivity, might involve further investment in public-private partnerships with mobile telecoms towards zero-rating educational content (Muhammad 2020). This would potentially alleviate the cost and connectivity issue related to accessing the LMS but does not account for conferencing applications. However, alleviating the cost and connectivity issue with the LMS specifically, would potentially impact satisfaction for the teacher.

Finally, intention to continue digital technologies use was predicted by satisfaction (beta = -0.343, $p < 0.05$) and perceived usefulness (beta = 0.309, $p < 0.05$), which explained 34% of the intention variance. Both satisfaction and perceived usefulness being statistically significant implies that

instructors will form intentions to continue using digital technologies if they find these technologies to be useful and are satisfied with them.

It should be noted that in the interview data, there were varying presentations of what constituted usefulness and satisfaction: some saw little use for digital technologies in their teaching, some saw it as a professional responsibility to understand how these digital technologies might work in teaching and experiment accordingly, and some felt it was an administrative requirement to use these technologies, even if they found little immediate benefit. This is potentially skewed to some degree by the institutional case under study in this paper: the period of time that the pandemic prevented campus access was limited and teachers were able to, with varying degrees of complication, resume their 'normal' teaching approaches once the campus had been re-opened. Further, complicating this satisfaction and use were references to student technological use: many teachers noted the disparity between those who had technology and access and those who didn't, and there was a suggestion that this impacted their intentions to use technology for their teaching.

Nonetheless, in this study instructors' satisfaction decreased with digital technologies use which eventually decreased continuance intentions. These dissatisfied instructors will be more likely to discontinue their digital technologies usage. There is a need for the university management to ensure that they address challenges pointed out by instructors to increase instructors' satisfaction and eventually increase continuance usage intentions. The relationship between perceived usefulness and continuance intention being significant and positive, implies that instructors perceive the digital technologies as useful in enhancing teaching activities. Therefore, the university should inform new users of the potential benefits of digital technologies and educate old users on how to use these technologies effectively (Bhattacherjee 2001).

Implications for research and practice

The implications of this study for research and practice are several. First, there is the need to understand the intention of instructors in their continued use of digital technologies and note the systemic dimensions that contribute to that intention. Models such as ECM help in this regard by surfacing factors such as confirmation, satisfaction, and perceived usefulness in the continuity of use and providing a rigorous approach from which to test hypotheses that might inform institutional strategy. Coupling this model with additional qualitative data gave specificity to the findings emerging from ECM.

Satisfaction was increasingly linked to an awareness of Moodle functionality and how that might inform the instructors' teaching practices; this for some was measured against the frustration felt in learning these new functions and the availability of support in doing so. The cost borne by instructors for connectivity clearly impacts the measure of satisfaction that ECM highlighted. Training, when mentioned, was received positively but didn't fully embed a sense of perceived usefulness in the larger body of instructors. As such, training might be reimagined around these ECM dimensions of satisfaction and perceived use in informing teaching practice. Yet without a model that provides an institutional measurement for the continued use of digital technologies, one that provides indications of satisfaction and perceived usefulness, efforts to promote the use of digital technologies are largely assumptions. ECM with an additional layer of qualitative analysis allows for a much more nuanced sense of institutional uptake and continued use of digital technologies, providing evidence that might inform both institutional expenditure and subsequent training.

Second, the implications for further research and practice involve using the data to inform the design of robust and pedagogically appropriate training programmes, ones that incorporate measures of confirmation, satisfaction, and perceived usefulness by linking training activity explicitly to pedagogical practice and utility. The perceived usefulness and subsequent continued

use of digital technologies were closely intertwined in the study: those who saw it as useful had developed practice to support continued use (as was the case for some in Moodle quizzes and assessments); those who did not see it as useful had largely either not been supported to explore the functions or had disengaged when confronted with the effort necessary to learn the functions of the technologies. Both are instructive for further developments at the university and for all of higher education.

CONCLUSION

This is an institutionally specific approach, and as such is not meant to be generalizable beyond this specific case. The university has a robust infrastructure for the use and promotion of digital technologies, particularly in the context of Tanzanian higher education. This might influence the measures of satisfaction and perceived usefulness expressed within this institutional context. Although similar levels of technology adoption and discontinued use were found at other universities (as discussed earlier in this paper), the specificity of the case of the university might skew these results. However, further study would need to be conducted to test that assumption.

Further study would also need to take these findings and begin to design and develop institutional activity to promote the meaningful use of digital technology, specifically for teaching. This might be best realised in several ways, with the first being the development of training to promote these measures of satisfaction and perceived usefulness. Such training would need to align these measures with pedagogical practice. To develop this training, participatory models of programme design might be considered, which have been used to some effect in Tanzania, most notably in the co-design of the educational technology itself (Mwandosya & Montero 2019; Rumanyika et al 2021). Using participatory approaches allows for the highlighting of existing factors related to the ECM model that impact the continued use of digital technologies; once highlighted, robust training programmes might be developed as a result.

Additionally, once the training is available there is need for consideration of measures that acknowledge instructors' participation in these training programmes. The university might consider teacher accreditation of some sort, whether through alignment with national or international accreditation organisations, or through micro-credentials such as digital badges designed with some specificity to Tanzanian higher education. Towards this end, Ghasia, Machumu & Smet (2019) detail an exploratory study at the Mzumbe University (MU), the Open University of Tanzania (OUT), the University of Dodoma (UDOM), and the University of Dar es Salaam around digital credentialing that suggested their potential, which might be capitalized on in further institutional activity.

It is important that these considerations involve participatory approaches as:

> 'the active participation of African scholars will shape the future of micro-credentials and digital badges implementation in the continent and Tanzania in particular so as to refute the claim of being a planetary laboratory of imported knowledge and tools' (p. 228).

This highlights another possible area of future study that might contribute to a more nuanced understanding of perceived usefulness and continued use, of locally relevant systems and content. This might include the availability of open educational resources (OER) in Kiswahili (Ngugi 2011), more efforts at providing Tanzanian specific digital training via open courses and MOOCs as a response to globalization in Tanzanian higher education (Tan, Harland & Daniel 2020), and ones designed in the Tanzanian context and that are potentially shared across Tanzanian higher education institutions.

This study provided a brief presentation of an institutional context that tried to determine the impact of the pandemic on the continued use of digital technologies in teaching. We noted what factors directly influence that continued use around satisfaction and perceived usefulness, as well as the impact that institutional support structures have on that continued use. The findings indicate the existence of a dynamic institution with uneven levels of sustained engagement with digital technologies. The pandemic did not necessarily provide the momentum towards sustained use that many suggested. Rather, we posit that continued use of digital technologies cannot be subscribed to any one characteristic, but rather be seen as a larger ensemble of micro (teachers), mesa (institutional support) and macro (commercial and national level activity) actors working in tandem to create measures of sustained use.

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