Extending the Technology Acceptance Model for E-learning Discussion Forum Adoption

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***Abstract* - The advancement on Information and Communication Technology and the Internet for educational purposes has been a staple discourse among researchers in recent years. However, preliminary investigations indicate that e-learning systems are underutilized due to the fact that some of their major features remaining inactive; features like electronic discussion forums. Despite several scholars reporting on high levels of e-learning systems implementation at Universities of Technology (UoT), it is disconcerting that discussion forums within these platforms remain poorly utilized. The purpose of this study is to establish constructs that may promote adoption and use of discussion forums. The Technology Acceptance Model forms the theoretical framework for this study and is extended by including digital inclusion, perceived attention and perceived enjoyment. Thirty participants were purposively selected from a third year Information Technology class and interviewed with regards to the different constructs which make up the Technology Acceptance Model. Findings of this case study suggest that, perceived usefulness and ease along with digital inclusion may positively influence adoption and use of discussion forums at UoT. The study contributes to the board of knowledge by providing useful insights into the application of the Technology Acceptance Model by establishing additional constructs that may promote discussion forum usage.**

***Keywords* - e-learning, LMS, Blackboard, digital inclusion, perceived attention, perceived enjoyment**

1. INTRODUCTION

Africa's Internet usage is growing steadily. It was predicted that almost one out of ten households would be connected to the internet by the end of 2014 [1]. According to the International Telecommunication Union, household Internet access on the African continent is continually growing at double-digit rates (18% in 2014, more than twice the growth of the world average) [1]. This extraordinary growth of Information and Communication Technology (ICT) suggests that a remarkable digital inclusion exists among many Africans. Indeed, enhanced Internet access has the potential to improve many people's socio-economic development.

The effective utilization of ICTs in education may contribute to the socio-economic development of many communities in Africa. The possibilities of enhancing quality educational outcomes through ICT and Internet usage have been a staple discourse in recent years [2]. Previous studies have reported on the value of social presence in online engagement [3], the potential of collaborative learning to foster enhanced critical thinking [4], and the importance of interaction on any online teaching and learning system [5]. These studies have demonstrated the capacity of ICTs to unveil a world of potential within teaching and learning where lecturers and students can communicate on a level which will enhance the quality of the learning experience.

Internet usage are promising among Africans, as well as their potential to foster effective learning through online interactions. However, insufficient studies have explored the factors that influence students in adopting online discussion forums (DFs) at South African UoT. The purpose of this study is to establish constructs that influence adoption of e-learning DFs that may optimistically lead to effective learning. A case study is used where data collection is achieved through face-to-face interviews. Content analysis is used to establish themes that contribute to the establishment of factors that influence e-learning adoption among South African UoT students. The impact of e-learning and DFs will firstly be presented followed by the theoretical framework. Thirdly, the research methodology section outlines the research design and data collection instruments. Results and conclusions are finally highlighted.

2. LITERATURE REVIEW

A discourse on DFs is incomplete without an examination of the broader domain within which it exists. For this reason, this paper explores e-learning, the broader domain in which the adoption and use of DFs occur, as a precursor to examining DFs themselves.

2.1. E-Learning

E-learning can be defined as information delivered on a digital device, such as a computer or mobile device, for the purpose of supporting learning [6]. The following e-learning merits have been identified: better access control to learning material; students receive the exact same material; e-learning material is delivered in the exact same way which allows for consistency of content and quality of instruction [7].

In order for e-learning to be utilized in an efficient manner, ensuring its successful transition to more flexible modes of delivery, requires full, long-term commitment and support from senior management in advocating, fostering and monitoring this strategic change [8]. Academics and students need to attend more training sessions in using e-learning if it is to be widely adopted [9]. A study on the user acceptance of e-learning technologies further revealed that a lack of institutional strategy, lack of time, and lack of training support were three of the most critical barriers to the successful adoption of e-learning technologies [10]. Furthermore, academics need to put aside their traditional teaching styles, their reluctance to adopt change and their general perception of increased work load and be more open in accepting e-learning technologies as an alternative approach to the teaching and learning process [11].

2.2. Discussion Forums

Most institutionally supplied e-learning technologies, such as Blackboard, Moodle and Vula, include DFs as one of their affordances [12]. This provides a cyber space capable of providing increased engagements among academics and students [13]. DFs not only increase collaborative engagement between academics and students, but also provide for a flexible and anonymous learning environment outside the classroom [14]. Added to DFs are social networking platforms which have been cited as increasing student engagement with academics and their peers.

Some of these platforms include Facebook, twitter, Myspace, Mixit, and WhatsApp, which operate according to the fundamental principles of DFs. These platforms create opportunities for students to share knowledge with their peers and friends in a fun, informal environment [15]. Facebook should be used for academic purposes since many study groups have been created on Facebook that are being used by students to discuss homework assignments and share answers [16].

3. THEORETICAL FRAMEWORK

The Technology Acceptance Model (TAM) was originally developed by Davis [17] and is currently one of the most widely used theories in technological adoption. TAM is an adaptation of the Theory of Reasoned Action (TRA) within the field of information systems (IS). The TRA posits that individual behavior is driven by behavioral intention, where behavioral intention is a function of an individual's attitude toward the behavior and subjective norms surrounding the performance of that particular behavior. It suggests that perceived usefulness and perceived ease of use determine an individual's intention to accept and use a given technology [18]. Figure 1 presents the original version of TAM [17] which includes two major constructs addressing individual attitudes toward using new technology, namely perceived usefulness and perceived ease of use. Positive attitudes towards using an electronic based system positively affects behavioral intention to use such a system.

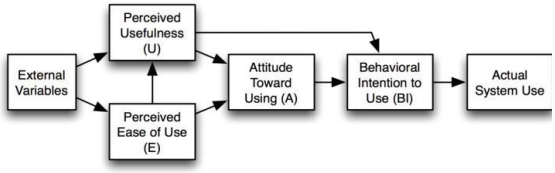

Figure 1: Original Technology Acceptance Model

Through the years, TAM has evolved and has been refined to include other variables and modified relationships. TAM has grown into a leading model in explaining and predicting technological system usage. It has become so popular that it is cited by many researches who consider user acceptance of technology [19] .

The TAM was selected for this study due to its predictive ability in studies involving students in technology adoption [20]. It was used to investigate factors that influence adoption of Blackboard e-learning DFs [21] at a UoT in South Africa. Davis [17] posits that practitioners should evaluate technology for two purposes: 1) to predict acceptability; and 2) to diagnose the reasons resulting in a lack of acceptance and to take proper measures to improve user acceptance. In this study, TAM was extended with digital inclusion, perceived attention, and perceived enjoyment.

4. RESEARCH METHODOLOGY

A qualitative case study is used where data is collected using semi-structured interview. Senior Information Technology (IT) students registered for the Information Systems III module at the Central University of Technology (CUT) constituted the target population. These students (147 in number) made use of DFs within the Blackboard learning management system (LMS called eThuto) during 2013 in order to improve their engagement with their course content, peers and academics. Since the exploration of student motivation to use discussions forums formed the basis of this study, purposive sampling was ideal for the selection of research participants. Qualitative case studies often require a number of interviews to be conducted until data saturation occurs. In this study, data saturation was established after 30 participants were interviewed, thereby establishing the sample size for this study.

Face-to-face semi-structured interviews were used to where the constructs of the TAM formed the focal areas of discussion. Content analysis was then applied to analyze the responses which were recorded during the 35 minute interview.

5. DATA ANALYSIS AND DISCUSSION OF FINDINGS

Considering that the main focus of this study is to gather students' perceptions and experiences of using and accepting DFs, it was therefore decided to use content analysis to analyze the qualitative data. The TAM constructs provided guiding themes for content analysis.

Each subsection starts with a definition of the construct and then presents the specific question asked to the participants in this study with their responses following suit. The number in brackets after the responses represents the number of students who indicated similar answers.

The sample consisted of Africans from different racial backgrounds, 18 being males and 12 females. Although gender representation was skewed in favour of males, this anomaly is simply indicative of the higher enrolment and participation rates of males in Science, Technology, Engineering and Mathematics (STEM) at universities. Participant ages ranged from 22 to 30 years of age. Nineteen participants had never used DFs before, while six had never heard about them.

5.1. Digital Inclusion

According to Washington State University [22], digital inclusion refers to individuals and disadvantaged groups having access, and the necessary skills required to use ICTs, thereby enabling them to take part in and benefit from an institution's growing cognition and information society. Selwyn & Facer [23] posits that digital inclusion occurs when all members of society are able to access the affordances offered by technology.

What challenges do you experience in your use of DFs?

Participants noted the following:

> Access to computer facilities have improved drastically over the past few years as it was a challenge to only make use of the computers in the library building. (1)
>
> Access to electronic devices such as laptops, tablets and smartphones has been promoted by the institution, which has helped to minimize a previous challenge of affordability. (1)
>
> I experience challenges in using DFs, but it would be a good idea for the university to appoint someone who would be responsible for providing additional help to students who struggle with the system. (9)

Are you aware of E-Thuto DFs?

> I am aware of DFs but have never received any sort of training. (28)

How can the University improve E-Thuto DF awareness among students?

> The university should make more students aware of DFs whether it is through a short course, a workshop or just a quick introduction in class. (12)
>
> It all comes down to the lecturer. They should introduce DFs to students and keep on reminding us to use it. (10)
>
> The use of smartphones for learning are so widespread that students can use them to go onto the university's LMS and access DF from anywhere and at any time. This fact will make competitions on DF a really good idea. Within no time, students will know about the competition and what they could win and thus many will know about and use the DF. (1)

The combination of readily available facilities and proper training could motivate students more to use DFs for educational purposes. Studies on the topic of ICT usage in the digital divide context have focused on examining demographic characteristics of users, such as gender, income, and level of education [24]; analyzing patterns of use [25]; and identifying benefits of use [26]. This study, however, adds to existing research by identifying the construct of digital inclusion that influences student usage of DFs within the Blackboard e-learning system.

5.2. Perceived attention

According to John Keller's ARCS (Attention, Relevance, Confidence, and Satisfaction) model, attention can be gained in two ways - perceptual arousal and inquiry arousal [27]. Perceptual arousal comes from using surprise or uncertainty to gain interest. Inquiry arousal stimulates curiosity by posing challenging questions or problems that need to be solved. During this study, the aim was to gain insight into which instructional approaches capture student's attention within the DF, if any.

What learning modes (e.g. text, video, graphics etc.) within E-Thuto DFs do you know?

> Students are not aware of the different learning modes within blackboard e-learning DFs and they use them mostly to text their peers. (28)

Are you motivated to learn by using various learning modes?

> Students would be more motivated to learn if they had been made aware of these different learning modes. (19)
>
> At times, students only go onto DFs when they are desperate for more information, for example just before a test; and different learning modes would definitely motivate them to go back more often. Even if discussions are not of an educational nature and they get an opportunity to get to know their peers, this would be great because in a class of 200 students, it is difficult to get to know each other. (1)
>
> Different learning modes, like pictures, audio and videos would make it easier and capture one's attention. Students would also not be limited to using only text. (1)

The researchers infer that the visual appeal and auditory affordances of online DFs may draw the attention of learners and motivate them to use them for educational purposes. In support of this statement, Felder & Siverman [28] posits that although there are numerous styles with which students learn, it would be sufficient for an instructor to include a relatively small number of techniques to meet the needs of many students in any class. The participants'

claims about perceived attention are consistent with Keller's [27] findings that the use of various instructional approaches motivate student attention to engage in academically productive activities. Keller [27] elaborates that students who perform well through the use of the same tried and true method of instructional approach will benefit from variation. As such, the variations of modes of information have the potential to capture and retain the attention of students with diverse learning styles.

5.3. Perceived enjoyment

Perceived enjoyment (PE) refers to the extent to which the activity of using computers is perceived to be enjoyable in its own right, aside from any academic consequences that may be expected [29]. Sun & Zhang [30] claims that perceived enjoyment plays a vital part in user technology acceptance and has great significance, especially for hedonic systems.

Do you find E-Thuto DFs pleasant?

> I perceive DFs to be pleasant. (26)
>
> It is enjoyable using DFs, but then threads should not go too long unanswered. (2)
>
> It is nice when everyone comes up with their own ideas and opinions about something. It is very interesting to see what others think and how their thoughts differ from your own. (1)
>
> DFs create that 'extra class feel', but in a fun way. It is enjoyable to learn so much from your peers and in turn contribute by sharing your knowledge with others. It is not fun studying alone, but knowing that there are others whom you can ask for help should you struggle. (1)

Do E-Thuto DFs offer you playful learning?

> I enjoy receiving replies on my posts and, with the help of my peers, getting to the correct answer. Through this exercise we realize mistakes and also learn from our peers (18).
>
> I see DFs more as a learning experience whereas sites like Facebook or Whatsapp offer me a more playful environment. (8)

How can E-Thuto DFs be more pleasant to students?

> Competitions or promotions would be effective in motivating students to use DFs. (4)
>
> Using different learning modes, such as uploading videos, pictures, or recordings of classes, would make the DF more pleasant. (10)

Van der Heijden [31] extended the TAM with perceived enjoyment and perceived attractiveness in order to address users' motivation toward the acceptance of websites. In van der Heijden's study, perceived enjoyment refers to "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated". These findings suggest that the inclusion of perceived enjoyment and attractiveness with the original TAM constructs provided the right combination of measurements to accurately test user adoption of a web-based system. The incorporation of short threads, different learning modes and promotions within the DFs may lead to an improved adoption of this e-learning system.

5.4. Perceived ease of use

Drawing on the TAM [17], perceived ease of use refers to "the degree to which a person believes that using a particular system would be free from effort".

Did you find it easy to become proficient in using DFs?

> I feel that the system was user-friendly. My prior DF knowledge and operational instructions given by the tutors helped me to become proficient in using the DF. (30)

Participants' experiences with the ease of use of DFs indicate that this construct influenced their willingness to adopt DFs for learning. These findings are in line with previous findings from technology adoption studies that perceived ease of use influences technology adoption [21]. However, findings of this study regarding the ease of use are contradictory to Danner & Pessu [9] and Nanayakkara & Whiddett [10] who state that user training, which improves ease of use, causes underutilization of educational systems. Possible reasons for this contradiction can be that the technology considered in this study (which is a DF) is a component of the entire LMS which participants are proficient at.

5.5. Perceived usefulness

Perceived usefulness is defined by Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance" [17].

Do you find E-Thuto DFs relevant/useful to your learning?

> Blackboard e-learning DFs were useful to my learning and definitely enhanced my performance. (30)

Have your grades improved by using E-Thuto DFs?

> I believe that Blackboard e-learning DFs contributed to my improved grades. (30)

Previous studies reported that perceived usefulness positively influences technology adoption [21]. These authors' findings have been corroborated with the participants' perspectives in this study. This further affirms the findings from [32] on the significant impact of perceived usefulness on attitudes toward using mobile banking.

5.6. Attitude towards using DFs

Attitude refers to an individual's positive or negative feelings about performing a targeted behavior, for example, behavior to the use a specific system. It involves an individual's judgment that performing a behavior is either good or bad and also a general evaluation that an individual is inclined or disinclined to perform the behavior [33].

What is your general attitude towards using E-Thuto DFs?

> I have a very positive attitude towards using DFs and feel that it is very helpful in my learning. (28)
>
> I have a complaint about posted questions that are left unanswered or about the types of discussions that have been initiated by my lecturers. (2)

Therefore, unlike the uptake of emerging technologies (mobile phones) by the elderly, where the intention to use the technology is influenced primarily by external factors (such as objectification which includes filial affection, safety and security [34]), student's attitude towards the use of DFs were generally positive. The relevance of DFs to student learning is expressed in their belief that DFs helped to improve their academic performance. This runs parallel to findings that ease of use has little influence on elderly users accepting and using available functionality of emerging technologies (e.g. mobile devices), leading to them deriving sub-optimal value from their usage [34]. Furthermore, wholehearted adoption can only occur if the adopter fully accepts the technology. If not, he or she is unlikely to progress fully and therefore remains a reluctant user of the technology. Perhaps a reason for this contradiction is that while the research participants for this study were trained on the use of DFs, thus contributing to their improved ease of use, the elderly usually lack sufficient training on the use of mobile phones often handed down to them by relatives or friends.

5.7. Behavioral intention to use DFs

Behavioral intention is defined as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" [35]. A high majority of participants demonstrated a positive behavioral intention towards the usage of Blackboard e-learning DFs.

In which other courses would you like E-Thuto DFs to be utilized?

> DFs should be introduced into all our subjects as it would increase student performance. (29)
>
> I am concerned about introducing Blackboard e-leaning DFs in all my subjects as it might be too overwhelming. (1)

Will you reuse DFs in the future?

> I will definitely reuse DFs in the future, especially if other students and educators are active on them, or if I come across a question I wanted the answer to and could not answer myself. (30)

Will you continue using DFs even if new threads are not created by the lecturer or other students?

> I will continue using Backboard DFs in order to help others by sharing my knowledge; or I will ask questions should I need assistance. (28)

Park [36] measured university students' behavioral intention to use e-learning. Results from Park's study indicated that the majority of participants intend to become heavy users of e-learning systems and that they intend on checking announcements from e-learning systems frequently. The validated TAM provides a useful framework for technology implementers who needed to assess the possibility of success for technology innovations and to pro-actively design technology based campaigns [37]. That said, some caveats should be provided as a minority of participants were skeptical about whether they would use DFs persistently, especially in responding to new threads posted by amateurish or inexperienced peers, whose credibility could not be confirmed. Most participants believed that they would continue to use the Backboard DFs in order to help others by sharing their knowledge; or to ask questions should they need assistance.

6. CONCLUSION

The study provided some insights on blackboard e-learning discussion forum usage. The original TAM constructs namely, perceived ease of use, perceived usefulness, attitude towards use and behavioral intention to use Blackboard e-learning DFs, were found to be the drivers for technology adoption. These findings are consistent with TAM related findings by previous studies [17].

This study's findings indicated that the additional constructs that were incorporated into the original TAM had a positive influence on 1) motivating students to adopt DF for learning purposes (digital inclusion); 2) capturing students attention of using DFs for learning purposes due to their visual appeal and auditory affordances (perceived attention); and 3) in motivating students to participate in DFs due to the different learning modes which exist (perceived enjoyment). The researchers concludes that underutilization of electronic DFs is associated with a lack of awareness of such e-learning affordances.

This study confirms that TAM is a valid model for assessing backboard discussion forum utilization within UoT in South Africa. The study extended the TAM with digital inclusion, perceived attention, and perceived enjoyment, thus contributing to the board of knowledge by providing useful insights into the application of the Technology Acceptance Model by establishing these additional constructs that may promote discussion forum usage.

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