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Adaptation of UTAUT2 Model in Understanding Student's Acceptance of Virtual Learning Agent.

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A R T I C L E   I N F O

A B S T R A C T

Background: The consequence of overwhelming practices of Internet and the explosive growth of digital technology in this recent era has tremendously affected the way people learn and communicate. The intention of implementing virtual learning agent (VLA) in e-learning setting is aimed to maximize student's comprehension in their learning environment. Hence, there is a need to study the readiness on how students perceive virtual learning agent in facilitating their learning. **Objective:** The main objective of the paper is to apply modified UTAUT2 model in assessing student' acceptance of virtual learning agent in their learning environment. **Results:** UTAUT2 model is evaluated and several modifications to the model are proposed based on our setting before it is adapted to measure virtual learning agent effectiveness. **Conclusion:** The modified model based on UTAUT2 framework is formed and hypotheses are constructed for testing.

INTRODUCTION

Effective teaching will only occur if there is a dynamic balance between content, pedagogy, and technology. Changes in any of these components require modifications to the other components. Changes in teaching and learning technology also require changes in the content to be delivered. Teaching and learning through e-learning requires the development of appropriate and interesting content for the technology to be fully utilized. The integration and interoperability between the e-learning and virtual learning agent used in higher education institutions is in line with the purpose to empower student know-how. To date, there is extensive research on ultimate design characteristics of effective pedagogical agent for virtual learning. While these are important, scarce studies have focused on the degree of student and learner's acceptance of the virtual learning agent. People simultaneously may have positive or negative attitudes or beliefs towards technology. A positive belief or attitude would foster individual acceptance of technology, while a negative attitude or belief might hold them back. The question of virtual learning agent adoption and the reasons encouraging students to use such technological innovation are still topic of debate among researchers (Lewis *et al*, 2013,

Scheutz, 2013, Natalie *et al*, 2015). Although previous studies have proposed many important viewpoints on the educational technology acceptance theory, virtual learning agent adoption acceptance is still not widely studied in Malaysian education institutions context (Raman *et al*, 2013). Thus, this study aims to understand student's acceptance of experiencing virtual learning agent by adapting UTAUT2 model as the fundamental technology acceptance model before proceed for effectiveness testing and verification.

Literature Review:

As a result of frequent discussion of disadvantages of e-learning which is the absence of communication and face-to face interaction and consequences in motivational aspects, the study on virtual learning agent is needed. With the aim of diminishing the limitations of the wide use of e-learning, virtual learning agent is introduced in pedagogical way. Veletsianos (2012) stated that learning will be more effective if a conversational style of presenting the course content is implemented. Hence, pedagogical agents, as its termed, comes in context back from 1970s has emerged through this three decades. Pedagogical agents expand the functionalities of intelligent tutoring systems that focus mainly on cognitive

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processes of learning by assimilate social interaction. Herman the bug (Lester *et al*, 1997), Steve (Johnson *et al*, 1997), Cosmo (Voerman *et al*, 1998) and Adele (Johnson & Shaw Erin, 1998) to name a few, are fundamental samples of pedagogical agent in literature. These agents play different roles and acts differently in their environment but share the same initiatives and basic framework of pedagogical agent design.

While those are popular and have been addressed in numerous research works, these recent years, virtual learning agent such as (Cardoso *et al*, 2004) for MathTutor and ABITS (Capuano *et al*, 2000)are among works done by incorporating intelligent agents in education technology. Furthermore, there is the existence of Xtranormal, developed in 2012 which allows user to create videos using animated characters in virtual environments and create presentation. HAPA, which stands for Harvester and Pedagogical Agents in E-learning Environments, is the latest one published which is intended to facilitate students in programming problems (Ivanovic *et al*, 2015). The approach used is by providing helpful and misleading agent to attest student critical thinking and knowledge skill.

Technology Acceptance Model:

Technology acceptance model has been developed with the drive to explain individual technology adoption by finding out the determinants and reasoning to use the technology. TAM by (Davis *et al*, 1989) has been studied over the years, based on the first theory developed by (Fishben & Ajzen, 1975) which is Theory of Reason Action (TRA). The foundation of TRA declares the attitude towards a specific behavior and subjective norms have an impact on behavioral intention that will determine actual behavior. The limitation of TRA is too much emphasis on belief's influence to the attitude and subjective norms, while personal belief only reflects in voluntary use, which if in the mandatory form, personal intention will obey the instructions. TAM, the most researched one was the first that includes psychological factors affecting computer acceptance. TAM's main constructs are perceived usefulness and perceived ease of use. Perceived usefulness reflects the level to which an individual believes that using a new system would improve the task performance, while perceived ease of use shows the degree of belief that a new system does not require much effort to run (Venkatesh & Davis, 2000). Their work found that perceived usefulness and perceived ease of use are the most influential variables in determining individuals' attitude towards the tested technology. TAM2, on the other hands, (Venkatesh *et al*, 2003) has dropped the attitude elements which was previously included in TAM and include social influences in their model. Therefore, numerous works assessing technology adoption in a wide variety of context ranging from organizational setting to consumer context were carried out using TAM and TAM2. The importance and impact of TAM is impressive, yet (Bagozzi *et al*, 2007) warns that although the strength of TAM is its parsimony, the parsimony itself is its weakness. It is unreasonable to expect that such a simple model would explain decisions and behavior fully across a wide range of technologies and adoption situations. Addressing some of its drawbacks, TAM3 theory was developed in the context of e-commerce and included effects of trust and perceives risk on system use (Venkatesh & Bala, 2008).

UTAUT as shown in Figure 1 stand for Unified Theory of Acceptance and Use of Technology was later developed in the meantime to improve the limitation of TAM, TAM2 and TAM3 model (Venkatesh *et al*, 2003). It is derived from eight prominent adoption model which explain as much comprehension of user intention which are TRA, TAM, Motivational Model (MM), Model of PC Utilization, Innovation Diffusion Theory and Social Cognitive Theory and TPB, a hybrid model combining constructs from TAM and TPB (C-TAM-TPB). Four key constructs introduced to explain and predict user acceptance of tested technology which are performance expectancy, effort expectancy, facilitating conditions and social influence with four key moderating factors which are age, gender, experience and voluntariness of use. Venkatesh (2003) defined performance expectancy as "the degree to which an individual believes that using the system will help a person to attain gains in job performance". Effort expectancy is defined as "the degree of ease associated with the use of the system". Social influence on the other hand means the extent to which a person perceives how vital others believe he or she should use the technology. Facilitating conditions means the extent of availability of technical support for using the new technology. Different improvements of this model in the recent years also stress the importance of other factors such as hedonic motivation, price value, and habit as mentioned in (Pahnila *et al*, 2011) and (Venkatesh *et al*, 2012) cognitive individual differences, learning, and teaching styles (Lin *et al*, 2013) and trust (Shibl *et al*, 2013). The meta-analysis of UTAUT studies by (Taiwo & Dawne, 2013) mostly confirms the initial findings of (Venkatesh *et al*, 2003) with regard to the relationships among the five constructs of UTAUT, but emphasizes that the outcome of empirical studies has been questionable, especially in the field of the social sciences, declining the accuracy of the models.

Most discoveries of UTAUT model adaptation show all relationships between the model's constructs to be significant, but many researcher highlights the absence of moderator testing in the majority of studies (Taiwo & Dawne, 2013) (Dwivedi *et al*, 2011).

The UTAUT model, as depicted in Figure 1, unified purpose is arguable as it was originally developed to explain employee technology acceptance and use and also organization-oriented. Hence, UTAUT2 which is the extended version of UTAUT came in 2012 and modify the previous model intended primarily for consumer-based oriented. Ever since the amount of technology applications and growth value of smart gadgets, the UTAUT2 model was extended with three additional determinants. Thereby, Venkatesh *et al* (2012) introduced additional constructs, added new relationships, and deleted one construct from their original model. Compared to UTAUT, the extensions proposed in UTAUT2 produced a substantial improvement in the variance explained by technology use. It has improved the variance of behavioral intention by 18% use of technology by 12%. The new constructs which are hedonic motivation (HM)(intrinsic motivation) defined as an enjoyment or happiness resultant from using a technology and play significant part in determining new technology adoption, price value (PV) where consumers have to bear the cost associated with the purchase of devices and services, and habit (HT) viewed as prior behavior (Lamayem *et al*, 2007) and secondly habit is where an individual believes the behavior to be automatic (Kim and Malhotra, 2005). Venkatesh *et al* (2012) modeled habit as having direct and indirect effect through behavioral intention. Demographic characteristics of learners/ students are the key moderator of the model mainly age, gender and experience. These would be determinants to behavioural intention and the use of the tested technology. As the model in Figure 2 shows, the Hedonic Motivation is also moderated by age, gender and experience, while the effect of Price Value is moderated by age and gender. Habit has both effects on Behavioural Intention and Use Behaviour, and is affected by age, gender and experience.
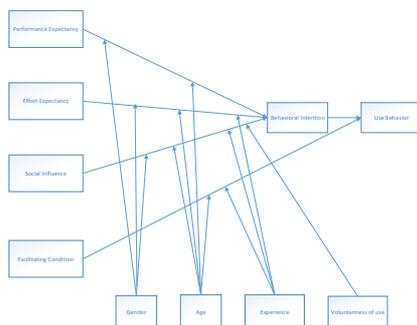

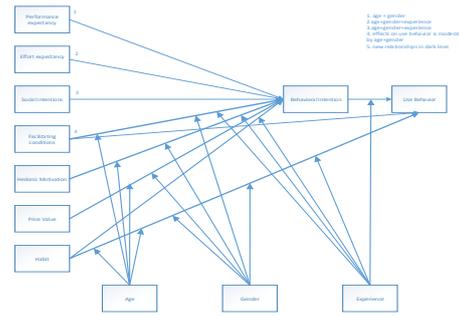**Fig. 1:** The UTAUT model.

Fig. 2: UTAUT2 (Venkatesh *et al.*, 2012).

A series of leading research papers that study technology acceptance in different areas, education being one of them has been traced and analysed (Ong *et al*, 2006), (Chen *et al*, 2011)(Sumak *et al*, 2010). Based on these studies, UTAUT2 model appears to be the most appropriate model to understand and explain student's acceptance using virtual learning agent. Compared to the TAM model, UTAUT2 includes a social component which is very important in learning environment. The importance and the extension of use of social networks and online communication in todays' society show the significance of a social component. While the tested environment could not provide many possible moderators (the equal age of students and mandatory use), gender are chosen to be tested for. The proposed model has been adapted to reflect determinants relevant on how students' perceive the virtual learning agent for facilitating their learning environment.

Hence, the objectives of the research study are recognized:

• To identify the key factors of UTAUT2 that lead student acceptance of virtual learning agent in their e-learning environment.

• To validate the suitability of UTAUT2 in educational technology environment, specifically virtual learning agent in e-learning setting.

Conceptual Framework And Hypotheses:

Based on UTAUT2 and the review from the scope of literature, the present study develops a research model that examines factors that determines students' intention to adopt virtual learning agent in e-learning. Figure 3 depicts the research model.

The proposed model for the present study takes into account the two new variables that has been highlighted in UTAUT2 and dropped the Price Value since it is insignificant to the research instrument and setting. Gender is highlighted as moderating variable to adopt the virtual learning agent.

Hedonic motivation refers to the fun or pleasure derived from using a technology (Hong *et al*, 2006). In the original UTAUT, the extrinsic motivation associated with technology use decision is represented as performance expectancy. However, modeling users' motivation in case of consumer

usage setting, such as virtual learning agent in e-learning, solely on extrinsic motivation would be an insufficient conceptualization. According to motivation theory, intrinsic or hedonic motivation plays an important role in determining technology use in the consumer technology use context (Venkatesh *et al*, 2012) In fact, hedonic motivation has been found to be a key predictor of technology acceptance in much consumer use setting (Hong *et al*, 2006). In our research context, both extrinsic and intrinsic motivation will positively influence students' intention to virtual learning agent for e-learning. Thus, we can hypothesize that:
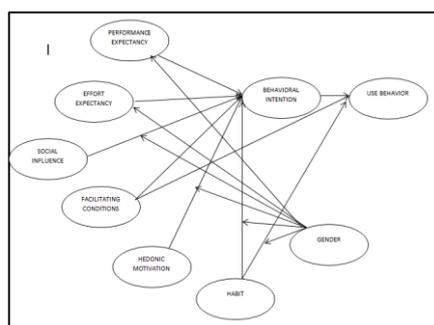

Fig. 3: The Proposed Research Model.

H1: Students' performance expectancy toward virtual learning agent for e-learning will positively influence their intention to adopt it.
H2: Students' hedonic motivation towards virtual learning agent for e-learning will positively influence their intention to adopt it.

The concept of effort expectancy is similar to the constructs perceived ease of use in technology acceptance model (TAM), and complexity in innovation diffusion theory (IDT). The relationship between effort expectancy and intention to use has been validated by many previous studies (Wang *et al*, 2008), (Venkatesh *et al*, 2003)(Park *et al*, 2007). In context of e-learning, Wang *et al* (2008) found that effort expectancy positively influence intention to use mobile learning. Thus, we can hypothesis that:
H3: Students' effort expectancy towards virtual learning agent for e-learning will positively influence their intention to adopt it.

The constructs of social influence is represented as subjective norm and social norm in earlier behavioral theories. Social influence in UTAUT has provided the most consistent explanation for individual's action in accepting e-learning technologies (Wang *et al*, 2008), (Gunawardana *et al*, 2009) Therefore, we hypothesis that:
H4: Social influence will positively influence students' intention to adopt virtual learning agent for e-learning

Limayem, Hirt and Cheung (2007) defined habit as "the extent to which an individual tend to perform behaviors automatically". Kim and Malhotra (2005) regarded habit as an equal with automaticity. In line

with the context of the study , (Venkatesh *et al*, 2012) conceptualized habit as a perceptual construct that reflects the results of an individual's prior experiences. Despite the different definitions of habit, they share the same idea that the feedback from previous experiences will affect various beliefs and behavioral intention. In the context of virtual learning agent for e-learning, if a student's automaticity level of using mobile phone is higher, then he or she intention to use virtual learning agent for e-learning will be more positive than those who with lower automaticity level. Thus, we hypothesis that:
H5: Students' habit of using technologies and IT savvy in daily life will positively influence their intention to adopt virtual learning agent in e-learning.

The constructs of facilitating conditions means to the extent if availability of technical support for using a new technology (Venkatesh *et al*., 2003). As in the research context, we hypothesis that
H6: Facilitating conditions will have significant influence on student's acceptance towards behavioral intention to use virtual learning agent.

Conclusion:
From a theoretical point of view, this study extended UTAUT2 into a new context in educational technology specifically virtual learning agent. Unlike many existing studies that examine the instrumentality influences on students' intention to adopt e-learning, this study expanded our horizon by considering the impacts of hedonic motivation, and habit of technology usage, moderating by gender on students' intention to adopt virtual learning agent.

The work in the paper would provide insights to educators and policy makers to prepare the right environment before introducing such technology for students. Furthermore, it is aimed to explore the applicability of UTAUT2 in educational environment by extending the diversity of the studied sample. Thus, the outcomes of the research will be a worthy referral for education community specifically virtual learning agent researchers, academics, government and students themselves beforehand. It will then ensure smooth implementation of these virtual learning agents in the respective institutions.

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