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Aim of this paper is to review technology (IS) acceptance theories and models, recognizing empirical evidence available to support the suitability of each theoretical model in explaining academicians' acceptance of online learning technology. Understanding the factors influencing system usage is crucial for decision-makers to recognize potential user needs and concerns, which could be addressed during the development phase of a system. Thus, for decades, researchers have been trying to understand why people accept new technologies. As a result, a wide variety of theories and models explaining the concept of technology acceptance. Some prominent theoretical models explaining technology acceptance are, ?Theory of Reasoned Action?, ?Diffusion of Innovation theory?, ?Theory of Planned Behavior?, ?Social Cognitive Theory?, ?Technology Acceptance Model?, ?Model of PC Utilization?, ?Motivational Model?, ?Unified Theory of Acceptance and Use of Technology?, ?UTAUT 2?, ?UTAUT 3?. The concept of academic's acceptance of online learning technology can be explained through several determinants that are operationalized through above information systems models.

Index terms—**1 Introduction**

academic acceptance of online learning environment is a topical research trend in the information system (IS) acceptance domain (Mirzajani, Mahmud, Fauzi Mohd Ayub, & Wong, 2016). In IS literature, the online learning environment is also referred to as a virtual learning environment, eLearning technology, Learning management system, or Content management system (Phungsuk, Viriyavejakul, & Ratanaolarn, 2017). The online learning environment is a web-based system using multimedia enabling anytime, anywhere access to educators and learners (Ma, Han, Yang, & Cheng, 2015). Online learning assists academicians in efficacious conduct of courses while providing students with enhanced learning experience (Poon, 2013). The popularity of online learning has resulted in an upsurge in studies that scrutinize its role within higher educational settings (Annetta, Folta, & Klesath, 2010). Some of these studies were keen on analyzing the acceptance of online educational technologies within the higher educational (HE) institutions. Other studies either focused on the use of eLearning for teaching and learning purposes and its effect on the educational outcomes of teachers and students or concentrated on examining the factors affecting teachers or students in accepting online learning technology in the higher educational (HE) institutes.

2 a) Technology Acceptance

In general, "acceptance" refers to the consenting action of an individual to receive what is being offered (Taherdoost, 2018). The term "technology acceptance" denotes the initial optimistic decision of an individual to use a technological innovation (Dillon, 2001). User acceptance is crucial for the growth and proliferation of any new technology (Bano & Zowghi, 2015). Besides, the term "acceptance" is an indication of user involvement in systems development (Bano & Zowghi, 2015). If policy makers understand the factors influencing system usage, user concerns can be addressed during the development phase of a system (Taherdoost, 2018). Similarly,

practitioners in IS field have been looking to answer this question to better the designs of systems they develop, in response to the demands of new users. For decades scholars have been attempting to understand why people accept new technologies resulting in a wide variety of theories and models explaining the concept of technology acceptance (Lai, 2017).

3 Academicians' Acceptance of Online Learning Environments: A Review of Information System

Theories and Models Technology acceptance models and theories have been useful in understanding user acceptance of various technologies in a wide variety of system domain. Acceptance studies are common in the fields of health, education, mobile technology, and consumer purchase behavior. Several technology acceptance models have been developed by various scholars, and each of these models explains acceptances of new technologies through numerous factors identified and validated with empirical evidence. Some prominent theories explaining technology acceptance are, Theory of Reasoned Action (Fishbein & Ajzen, 1975), Diffusion of Innovation theory (Rogers, 1983), Theory of Planned Behavior (Ajzen, 1985),

4 b) Overview of Technology (IS) Acceptance theories

Social Cognitive Theory (Bandura, 1986), Technology Acceptance Model (Davis, 1986(Davis, , 1989;;Davis, Bagozzi, & Warshaw, 1989), Model of PC Utilization (Thompson, Higgins, & Howell, 1991), Motivational Model (Davis, Bagozzi, & Warshaw, 1992), Unified Theory of Acceptance and Use of Technology-1(Venkatesh, Morris, Davis, & Davis, 2003), UTAUT-2 (Venkatesh, Thong, & Xu, 2012), UTAUT-3 (Farooq et al., 2017). These theories/models are mostly refined or extended or combined and applied to study user acceptance of technology in different domains.

5 c) Academicians acceptance of technology

The user adoption precedes the effective implementation of that (Al-Emran, Mezhyuev, & Kamaludin, 2018). Similarly, user resistance toward any new technology costs more time, money, and effort resulting in a loss of benefits attached to the technology (Davis et al., 1989). Past studies suggest the importance of academics' acceptance of online learning technology in higher educational (HE) institutions. Further, the field of research that focused on factors affecting eLearning acceptance is still in the initial phase that needs to be examined from different perspectives (Holsapple & Lee-Post, 2006; Nanayakkara & Kusumsiri, 2013). Some determinants academic's acceptance of online learning technology have been operationalized using educational theories, while other predictors have been captured through other information systems (IS) acceptance models (Taherdoost, 2018). However, determining an appropriate theoretical framework that can best explain academic's acceptance of online technology is not an easy task. On the assumption that an IS acceptance models could support to develop a theoretical framework to best describe academic's acceptance of technology in the HE context, technology acceptance theories and models are critically reviewed in this study, considering the empirical evidence available to support the suitability of each theory in the study context.

6 II.

7 A Critical Review of IS Acceptance Theories

It is felt essential to assess each theory independently to understand their appropriateness in explaining academic's acceptance of online learning environments. For this purpose, this paper presents a critical theoretical, and empirical assessment of each prominent theory and its applications in academic's IS acceptance.

Road map of the IS acceptance theory development is presented in figure 1. TRA was initially developed by Fishbein and Ajzen (1975) for sociological and psychological studies. According to Teo (2013) TRA is the best model to explain teacher's technology acceptance. Few studies have employed TRA as the base theory to explain academic technology acceptance (Johnson & Ma, 1999; Rizzo & Kirkendall, 1995). However, scanty of the literature suggests that TRA was not a popular theory in predicting IS system adoption of academics. In this model, three cognitive components collectively explain technology acceptance behavior of humans. They are, attitude (favorable or unfavorable feeling to act in a certain manner), social norms, (social influence to behave in a particular manner) and behavioral intention (individual's cognitive decision in behaving in a particular method). Moreover, TRA suggests that human behavior is rational, systematic, and volitional. Therefore, TRA is evaluated through the measurement of boundary factors such as volition or will, intention stability over time, and intention. These factors are tested against variables such as time horizon, action, target, specificity and the study context. TRA does not address the effects of habit, ignoring moral factors and cognitive deliberation in predicting technology acceptance, which is the main weakness of this theory. Additionally, usage voluntariness is a critical issue in TRA validation.

8 b) Theory of Planned Behavior (TPB)

TPB was developed by (Ajzen, 1985). In this model, TRA was extended with a new variable called perceived behavioral control (PBC). In this framework, perceived behavioral control is determined by the resources available, significance of available resources and opportunities and skills available to achieve a behavioral outcome. Similar to TRA, TPB assumes that behavioral intention (BI) affects technology use behavior. However, in TPB, the actions of an individual that are not accounted by volitional control is discussed under perceived behavioral control. Therefore, the introduction of the variable PBC is a key advancement of this model against the limitations excited in TRA. Another benefit of adding a component such as PBC is that it permits adding factors like self-efficacy. TPB model suggests that PBC directly influence the actual behavior, in addition to its indirect effect on actual behavior through behavior intention (BI) to use a particular technology. Thus, in TPB three factors namely perceived behavioral control, subjective norm, and attitude, affect the behavioral intent of an individual which ultimately trigger actual use behavior of technology. However, this model has several problems. Firstly, a favorable attitude to use a system may not be significant in a setting where technology access is an issue. Next, TPB appears more appropriated to explain voluntary use of technology since the outcome behavior can be predicted in the presence of factors affecting individual's voluntariness in technology acceptance behavior. The applicability of TPB in explaining the academic acceptance of the technology was validated by Teo and Beng Lee (2010) and J. Lee, Cerreto, and Lee (2010).

9 c) Theory of Interpersonal Behavior (TIB)

The theory of Interpersonal Behavior (TIB), focuses on clarifying complexities in human behavior when affected by emotional and social factors (Triandis, 1977). In this model, weaknesses of TRA and TPB is addressed by adding habit, affect, and facilitating conditions in to already available predictors. In this, social factors are elaborated as social roles, social norms and self-concept. According to TIB, human behavior is not completely planned, nor it is automatic; nor it is entirely autonomous or completely social. TIB is different from TRA since it attempts to explain variance in total when TRA explains change in behavior with minimum factors. Scholars supporting TIP argue that even the smallest amount of variance is vital to explain, especially if the behavior in consideration is critical. In this model, behavioral intention is formed by factors such as emotions, habits, and social factors. The TIB claim behavior in three levels. In the first level, beliefs, attitudes, and social factors affecting human behavior is molded by personal characteristics and previous experience. The second level describes how cognitive, affective, and social factors along with normative beliefs influence intention to use a particular technology. The third level predicts human behavior through behavioral intention, past experience, and situational factors. The complexity of the model is considered as the main weakness, and it lacks parsimony compared to TRA or TPB. Further, TIB does not provide operational definitions for the variables, leaving it to the researcher. The application of TIB in explaining the teacher's acceptance of educational technology is evident in the studies of Misbah, Gulikers, Maulana, and Mulder (2015).

10 d) Technology acceptance model (TAM)

The TAM (Davis et al., 1989) is derived from the TRA framework; however, due to the unspecified theoretical status of TRA subjective norm was removed from the TAM model. This model explains technology acceptance using three independent factors, namely perceived usefulness, perceived ease of use, and attitude to use technology. According to TAM authors, perceived usefulness, perceived ease of use has a significant impact on attitude. The behavioral intention mediates the relationship between attitude and actual usage. (Kim & Woo, 2016). As a result, TAM received a considerable amount of empirical support during past few decades suggesting its robustness in technology acceptance. However, TAM does ignore the impact of social influence on technology acceptance. Therefore, critics argue that TAM cannot be used to test technologies outside the workplace. Further, as evident in most empirical studies, high prediction of usage is achieved by adding external variables to the TAM model. Furthermore, TAM does not consider the impact of intrinsic motivation of individual in accepting technology. Therefore, its ability to predict technology adoption in customer contexts is debated by critics, who state that technologies are used by individuals not only to carry out tasks but also to satisfy their emotional needs. Thus, lacking affective components/variables are considered as the main weakness of this model.

11 e) Extended TAM (ETAM)

In the ETAM (Venkatesh & Davis, 2000), TAM was extended with new factors. This alteration improved its predictive power, specificity, and adaptability. ETAM studies have gone in two directions. The researches on the first root focus on the precedence of perceived usefulness and behavioral intention. In this, social influence (social image, subjective norm, voluntariness) and cognitive factors (output quality, job relevance, result demonstrability) were added. There this model was outperforming in both mandatory and voluntary environments. The second set of studies focused on studying constructs that influence perceived ease of use. Two groups of antecedence of perceived ease of use have been discussed in these studies. They are adjustments and anchors. Anchors include general beliefs such as "enjoyment" and "objective usability" regarding the use of computer systems. The adjustment set includes direct experience of given system use such as self-efficacy, external control, anxiety, and

computer playfulness. ETAM was found in some studies of academic's acceptance of online technology (Fathema, Shannon, & Ross, 2015; Teo, 2009; Waheed & Jam, 2010).

12 f) Igbaria's Model (IM)

The IM(Igbaria, Parasuraman, & Baroudi, 1996)explicate that both external and internal motivators influence individuals' technology acceptance decision (Igbaria, Schiffman, & Wieckowski, 1994). This model postulate "perceived enjoyment" as an intrinsic motivator and "perceived usefulness" as an extrinsic motivator which influences "attitude" and "use behavior". Also, the model assumes that pleasure or fun, computer anxiety, computer satisfaction, usefulness directly and indirectly affects technology use. Other relationships highlighted in this model are that perceived usefulness influence perceived enjoyment and computer anxiety has a negative effect on perceived usefulness and enjoyment. An application of IM was found in the study of Teo and Noyes (2011) in examining the use of technology among preservice teachers.

13 g) Social Cognitive Theory (SCT)

This theory is inspired by social psychology. In the SCT (Bandura, 1986), acceptance is predicted by integrating a set of personal, behavioral, and environmental factors bi directionally. Therefore, all three factors influence each other in a reciprocated manner. In SCT, the behavior is discussed as an issue on performance, usage, or adoption. In this, personal factors are defined as cognitive and demographic characteristics of a person that portray his or her personality. Environmental factors include aspects in the social and physical environment around the individual. Some variables encompassed in the SCM are Anxiety, self-efficacy, Affect, performance, or outcome expectation. K. T. ??ong

14 h) Innovations Diffusion Theory (IDT)

The model IDT (Rogers, 1983) introduces four factors such as time, channels, communication, innovation, and social system that affect the diffusion of innovative technology. IDT framework has been widely used in acceptance studies in individual (Brahier, 2006). In IDT, three major components are integrated to predict adoption behavior. They are adopter's characteristics, features of the innovation, and adoption decision process. Adopters are identified in five groups based on their similarities in their adoptive behavioral characteristics, namely, innovators, early adopters, early majority, late majority, and laggards. Features of the innovation are described through factors such as relative advantage, complexity, trialability, compatibility, observability that influence acceptance of any innovative technology.IDT further suggest that innovation adoption process should follow the five-step approach of confirmation, acquired knowledge, decision, execution, and persuasion of the adopter through effective communication for a prolonged period (Rogers, 1983). Compared to other acceptance frameworks, IDT has less power in explaining technology use behavior (outcome), which is the main weakness of this model.

15 i) Perceived characteristics of Innovating Theory (PCIT)

This framework extends IDT theory by adding three components namely, innovation characteristics, perceived voluntariness, and actual behavior. The PCIT (Carter & Belanger, 2004) postulate that perceived voluntariness, and innovation characteristics effect the actual behavior of the individuals in accepting or rejecting technology. Innovative characteristics encompass; image, results demonstrability, and visibility, providing evidence that results demonstrability and visibility are components of observability, which positively correlate with the use and acceptance of the technology. Scanty of literature was found to validate the appropriateness of PCIT in using for academic acceptance online learning environments.

16 j) The Motivation Model (MM)

In this model (MM) technology acceptance is predicted using two factors (Davis et al., 1992). They are intrinsic motivation and extrinsic motivation. Extrinsic motivation is defined as the perceived valued outcome derived by performing an activity through the system. Improved job performance or time-saving, rewards and recognition are typical extrinsic motivators for system users. Intrinsic motivators are defined as psychological reasons other than apparent benefits obtainable from the system use. Typically, fun, enjoyment are internal motives of system use. The MM hypothesis that output quality and "perceived ease of use" influence "perceived usefulness" and "perceived enjoyment". MM authors postulate that, due to the mediated relationship between ease of use, output quality, and perceived usefulness, the former two variables have indirect relationships with behavioral intention to use technology. Scanty of literature was found to validate the appropriateness of MM in using for academic acceptance of online learning environments.

17 k) The model of PC Utilization (MPCU)

This model fits to test technology acceptance from the perspective of personal computer utilization. MPCU assess actual behavior of humans in computer usage. Therefore, the component "behavioral intention to use" is excluded in this model. Additionally, this model does not consider the effect of habit in PC utilization since

it supposedly has a tautological relationship with an individual's current use of computers. MPCU assess the influences of factors such as "facilitating conditions", "social influence", "complexity", "affect", "long term value of use", "perceived consequences" and, "job fit" on the computer use behavior of individuals. The use of MPCU in predicting academicians use of computers was confirmed by Ifenthaler and Schweinbenz (2013). (Fishbein & Ajzen, 1975), the Motivational Model (Davis et al., 1992), the Model of PC utilization (Thompson et al., 1991), the Theory of Planned Behavior (Ajzen, 1991), the Combined TAM and TPB (Taylor & Todd, 1995), the Technology Acceptance Model (Taylor & Todd, 1995), the Innovation Diffusion Theory (Moore & Benbasat, 1991) and the Social Cognitive Theory (Bandura, 1986). Based on the predictive variables of these models, four factors such as performance expectancy, effort expectancy, social influence, and facilitating conditions were identified in the UTAUT to explain behavioral intention to use technology. Further drivers of technology acceptance, namely, performance expectancy, effort expectancy, social influence, facilitating conditions, habit, hedonic motivation, prize value with an additional independent variable namely personal innovativeness in IT. The UTAUT 3 was initially tested in an educational setting in testing the acceptance of lecture capture system of executive business studies in Malaysia.

18 III.

19 Discussion

Scholars have developed multiple theories and models to understand human behavior in different contexts. Studies of technology acceptance have gained popularity over the last few decades, and this resulted emergence of various adoption models rooted through numerous disciplines. For instance, innovation diffusion theory (IDT) arose from sociology, whereas the "theory of reasoned action" (TRA) emerged from social psychology and social cognitive theory (SCT) aroused in psychology. However, all these theories have proved their significance in predicting human behavior related to technology adoption. Same time, these theories focus on different aspects of human behavior applicable in diverse settings. For instance, IDT explains the behaviors of humans. However, models like TRA or TPB is focused on adoption decisions where organizational characteristics play a crucial role.

When theories like SCT assimilate the effect of the perceived outcome on when predicting human behavior; other frameworks such as TAM solely rely on individual's perceptions (believes) that determine technology adoption. Some models like IDT, TPB, and TAM, have unidirectional causal relationships lined up from external factors to cognitive beliefs that affect attitudes and behavior. In contrast, theoretical models such as SCT has bidirectional causal paths, indicating that external factors, cognitive factors, emotions, and behavior affect each other, continuously.

TIB includes all constructs of TPB and more (i.e., habit and facilitating conditions) adding to its explanatory power. Therefore TPB, TIB frameworks are conceptually similar. But TPB is commonly seen in acceptance studies in predicting individuals' technology acceptance behavior than TIB. Similarly, some others theories like TAM and IDT have overlapping factors such as perceived ease of use (TAM) vs. complexity (IDT); perceived usefulness (TAM) vs. relative advantage (IDT). Further, the notion of facilitating conditions (UTAUT) is captured as perceived behavioral control in TPB, compatibility in IDT, or facilitating conditions (MPCU).

In most IS acceptance studies, a distinction between affection and cognition is not recognized. Therefore, Taherdoost (2018) (Taherdoost, 2018).

In terms of behavioral antecedents, some theories have emphasized on internal factors (antecedents) such as perceptions, values, feelings, attitudes, and intentions; while other theories focus on external factors such as social norms/social influence, rewards and incentives, organizational level constraints. Also, certain models have overlooked the operational definitions of the variables included in the model. (i.e., TIB) which make them difficult to measure.

20 IV.

21 Conclusion

In this analysis, most prominent technology acceptance theories and their application in testing academic acceptance of technology were reviewed. It appears that IDT, TAM, and UTAUT are the mostly employed theories of academic's technology acceptance. Strong evidence was found confirming the correlations between key constructs of these models.

However, most empirical studies either modified or extended the original framework to explain the notion of academic technology acceptance. These studies signify several factors as determinants of academic's acceptance of online learning technology. Intention and attitude are the two main significant factors determining technology adoption behavior, influenced by several other independent antecedent variables such as perceived usefulness (performance expectancy), ease of use (effort expectancy), perceived risk (anxiety), perceived behavioral control (self-efficacy), social influence and facilitating conditions.

The scope of this study is limited to identifying the evidence to support the suitability of IS theories in explaining academicians' acceptance of online learning technology. Thus, this study does not focus on the theoretical concepts that explain user behavior beyond "acceptance". (i.e. post adoption behavior or continuous usage behavior). Further, this study does not provide an empirical analysis or a statistical evaluation to judge

21 CONCLUSION

the suitability of each theory in understanding academics' technology acceptance. Future studies should focus on assessing other aspects of technologybased learning that is essential for successful proliferation of such systems; beyond typical use and acceptance. Finally, to prevent from any emerging gap between concepts (theory) and practice, both researchers and practitioners should make use of existing theoretical bases to develop measures and process models to influence potential users to accept technologies such as online learning environments.

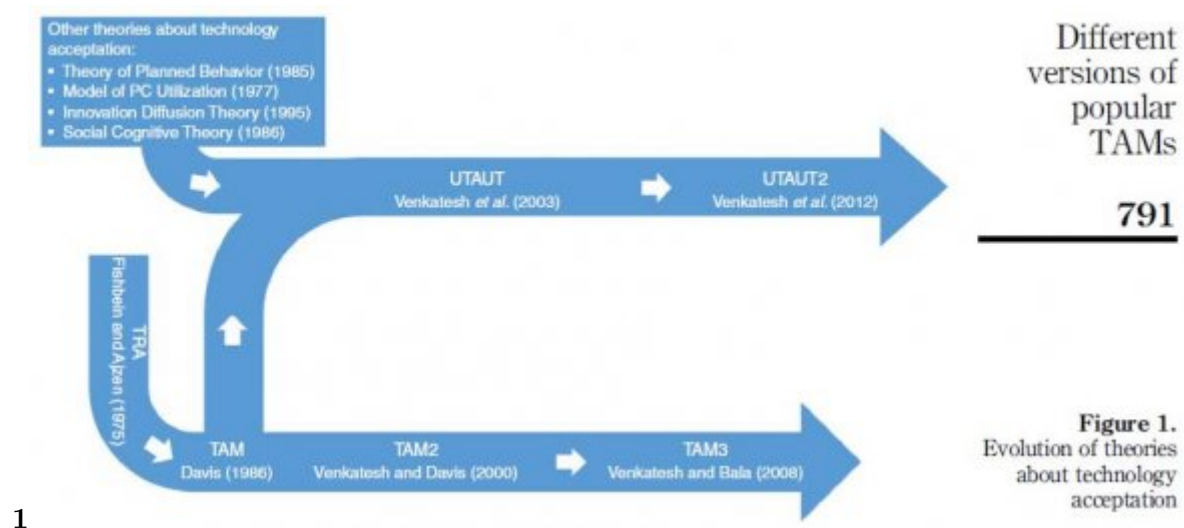


Figure 1: Figure 1 :

It has been used by many researchers testing acceptance of vast variety of technologies such as, academic use of online technology (Gibson, Harris, & Colaric, 2008; Teo, Lee, Chai, & Wong, 2009; K.-T. Wong, 2013; Yuen & Ma, 2008); e-banking (Lule, Omwansa, & Waema, 2012); clinical applications (Li, Huang, Xu, Li, & Lu, 2012); consumer technology

Figure 2:

Figure 3:

m) Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

The UTAUT model was extended by Venkatesh et al. (2012) and named it UTAUT2. The UTAUT2 consist of seven significant factors, of which three are new. The existing constructs (performance expectancy, effort expectancy, social influence and facilitating conditions) and the novel constructs (hedonic motivation, habit and price value) collectively predict an individual's intention to use technology. Its authors suggest that this model is more suitable to test the IS acceptance in the consumer setting. However, UTAUT 2 have been empirically validated in studies of (Admiraal et al., 2017; El-Masri & Tarhini, 2017; Raman & Don, 2013) explaining academic's acceptance of online learning technology.

n) The Unified Theory of Acceptance and Use of Technology 3 (UTAUT3)

The UTAUT3 framework Farooq et al. (2017) was introduced by extending the UTAUT2 framework. The UTAUT3 encompasses eight (

Figure 4:

Perlusz (2004) argue that both beliefs and emotions

acceptance behavior with few exceptions from theories such as UTAUT in which all the predictors of technology acceptance are cognitive (beliefs and perceptions).

In technology acceptance theories, emotions are mostly conceptualized as negative effects. For instance, computer anxiety (Chiu & Churchill, 2016; Russell & Bradley, 1997; Saadé & Kira, 2009), fear (Balanskat,

(feelings/affect) influence technology

Blamire, & 2006) worry Ke-fala,

(MacGregor, 1991) In contrast, positive emotions such as joy, liking, happiness, enthusiasm, contentment were largely ignored in these theories

Figure 5:

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21 CONCLUSION

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