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Abstract

This article discusses the evolution of the technology acceptance model on the acceptance of technology in purchase activities. To review the evolution of the technology acceptance model, this paper uses a systematic review approach. The study assessed the development of ten prevalent technology acceptance model and confirmed that it improves the validity and reliability of the technology acceptance model. However, these models usually validated by measuring behavioural intention to use rather than actual usage. In comparison, the UTAUT2 is the all-inclusive, and robust model that actually uses a wide variety of contextual settings, which theoretically has broader applicability.

Keywords: Technology Acceptance Model, Systematic Literature Review, Consumer Behaviour.

Introduction

Consumer behaviour shifted over time. In today's fast-moving world, people are increasingly expecting things that can do more than just relate to all senses, offer a choice of new touchpoints and truly integrate new experiences (Stankevich, 2017). Technology has brought huge improvements to businesses and consumers. In order to leverage power technology, it is essential to examine the process and uniqueness of consumers acceptance towards new technology (Hennig-Thurau, Hofacker, & Bloching, 2013). Indeed, the consumer decision-making process is a crucial component of consumer behaviour trends. However, with the introduction of e-commerce and social trade platforms, the apprehension of consumer behaviour has become vigorously demanding lately.

From a literature point of view, interest in e-commerce can be classified as "consumer's engagement in online exchange relationships with Web vendors" (Khanam, Siddiqui, & Talib, 2013; Sridhar, 2017). In the case of social commerce, consumers engagement involves direct and indirect commercial sales. Direct transactions mean the consumer's buying behaviour during the purchase phase of his/her decision-making process. Contrary, indirect transactions

include e-word-of-mouth (e-WOM) referral actions various reasons such as the searching for information, selection process and after-sales services for consumer decision-making is characterised by demands and business information sharing on social media (Zhang, Lu, Gupta, & Zhao, 2014). However, the main technical drawbacks are the inadequacy of human and social communications between consumers and corporations (Akman & Mishra, 2017).

The opportunities linked businesses and technologies have created a dominant interest for researchers and practitioners alike. As there is a growing number of studies on consumers behaviour towards technology, various technology acceptance model have also been developed and created (Kim & Park, 2013; Afrasiabi Rad & Benyoucef, 2011; Sheikh, Yezheng, Islam, Hameed, & Khan, 2019; Sridhar, 2017; Valerio, William, & Noémier, 2019; Yin, Wang, Xia, & Gu, 2019). Since consumer interaction with technology is a common field of study, it is important to understand what drives consumer acceptance and use of technology in their daily lives. However, as numerous researchers have pointed out, the challenge was to determine what causes people to accept and oppose technology (Davis, 1993; Li, 2019).

In order to enhance market efficiency innovations, they must first be accepted and used by the consumers (Harper & Utley, 2001; Venkatesh, Morris, Davis, & Davis, 2003). Corporations and governments with large investments have developed new potential technologies. However, this investment may not be of value if innovations are not implemented and used (Sharma & Mishra, 2014). If consumers do not embrace and welcome accessible technology, perhaps a state-of-the-art information system with high technical performance will be best to none (Legris, Ingham, & Colletette, 2003; Venkatesh, Thong, & Xin, 2012).

There has been a large number of theoretical models, mostly focused on theories in psychology and sociology used to explain the acceptance and use of technology (Venkatesh & Davis, 2000). Over the past few years, the number of studies focused on technology acceptance has increased significantly. Even so, limited studies have carried out a thorough analysis of the technology acceptance model in order to better understand its implementation and adaptation by focusing on the trend and rationale for such evolution. Therefore, it is vital to take a closer look at the prominent underpinning theories and models as this study aims to fulfil that purpose.

Methodology

This paper uses a systematic analysis approach to review the evolution of the technology acceptance model. Systematic review is a type of literature review that uses systematic techniques to gather secondary data, objectively analyse scientific studies, and qualitatively or quantitatively synthesise findings (Armstrong, Hall, Doyle, & Waters, 2011). The rigidity of the systematic review system methodology will ensure and ultimately strengthen the validity of the study, and the latter provides necessary evidence of practical information to address logical management problems (Hanafiah, Hemdi, & Ahmad, 2015). This study identified the relevant, prominent technology acceptance model, then concentrated on evaluating the evolution of the acceptance model and eventually analysed the models by comparing the core construct.

Prominent Technology-Related Models

Numerous theoretical models have been developed, mainly from theories in psychology and sociology, used to explain the acceptance and usage of technology (Momani & Jamous, 2017;

Samaradiwakara & Gunawardena, 2014; Venkatesh & Davis, 2000). Based on an extensive literature review, this study found several theories and models commonly used to understand what drives people to adopt and oppose technology. Table 1 showed prominent underpinning theories and models for the utilisation of technology by customers.

Table 1: Prominent Technology-Related Models

Theory /Model	Acronym	Author	Definition
Innovation Diffusion Theory	IDT	Rogers (1962)	Describe as the innovation-decision process.
Theory of Reasoned Action	TRA	Fishbein and Ajzen (1975)	Describe as adaptable behavioural theory and model the attitude-behaviour relationships.
Social Cognitive Theory	SCT	Bandura (1989)	A learning theory derived from the idea that people learn by observing others.
Technology Acceptance Model	TAM	Davis (1989)	A model that involves psychological factors affecting technology acceptance.
Extended Technology Acceptance Model 2	TAM2	Venkatesh and Davis (2000)	TAM2 includes two theoretical processes that cover social influence processes and cognitive instrumental processes to explain the effects of the various determinants on perceived usefulness and behavioural intention.
Theory of Planned Behaviour	TPB	Ajzen (1991)	This theory is to foretell an individual's purpose to seize in the behaviour at a particular time and place.
Model of PC Utilization	MPCU	Thompson, Higgins and Howell (1991)	This model predicts PC utilization behaviour.
Motivational Model	MM	Davis, Bagozzi and Warshaw (1992)	This model is widely used by researchers in psychology.
Combined TAM and TPB	C-TAM-TPB	Taylor and Todd (1995)	This model is determining of influence of social and control factors that are not in TAM but exists in TPB.
Unified Theory of Acceptance and Use of Technology	UTAUT	Venkatesh, Morris, Davis and Davis (2003)	Aims to explain the intentions of the user to use an information system and the subsequent behaviour of users.
Unified Theory of Acceptance and Use of Technology 2	UTAUT2	Venkatesh, Thong and Xu (2012)	UTAUT2 extends the UTAUT with the main objective the new constructs could give a better

explanation in new emerging technologies and consume ruse.

Sources: Researchers' findings

Innovation Diffusion Theory (IDT)

Everett Roger's in 1962 classical work on diffusion research entitled the Diffusion of Innovation Theory which has been widely applied by researchers over the decades (Sharma & Mishra, 2014). First published in 1962 and now in the fifth edition, The Diffusion of Innovations has become the second most-cited book in the social sciences (Dearing & Cox, 2018; Rogers, 1962, 2003). One of the ancient social science theories to study any transformations (Momani & Jamous, 2017).

Diffusion is a particular type of interaction that concerns the activity of new ideas, a process that has been communicated through certain networks over time among the five social systems, and each of these five (5) social systems faces its innovation (Rogers, 1962; 2003). When new ideas are invented, disseminated, and accepted or rejected, leading to inevitable consequences, social change takes place (Rogers, 1962; 2003). The core concept of the theory is that four (4) elements have an impact on the broad reach of the new idea such as innovation, interaction channels, time and social system (Estabrooks, Thompson, Lovely, & Hofmeyer, 2006; Rogers, 2003). The instrument of diffusion process includes five (5) social systems, namely, knowledge, persuasion, decision, implementation, and confirmation. Awareness of the social system is when a person becomes mindful of an innovation and has certain insights or knowledge about how the system operates or functions. The persuasion social system is where the individual procedures have a favourable or disadvantageous mindset towards innovation. The social decision process is where a person engages in activities that lead to an alternative to accept or reject the innovation. Meanwhile, implementation is where the person applies innovation and the final validation is where the outcomes of innovation-decision that have already been made-are tested (Chia & Garrett, 2009; Momani & Jamous, 2017; Orr, 2003; Rogers, 1962, 2003; Wani & Ali, 2015).

There are eight (8) core constructs of the model and Table 2 present the pertinent core constructs of Innovation Diffusion Theory (IDT) (Dearing & Cox, 2018; Momani & Jamous, 2017; Moore & Benbasat, 1991; Rogers, 1962, 2003; Samaradiwakara & Gunawardena, 2014).

Table 2: Core Constructs of Innovation Diffusion Theory (IDT)

Theory/Model	Constructs	Moderators
Innovation Diffusion Theory	<ol style="list-style-type: none"> 1. Relative advantage 2. Ease of use 3. Result demonstrability 4. Tribalilty 5. Visibility 6. Image 7. Compatibility 8. Voluntariness of use 	<ol style="list-style-type: none"> 1. Experience

Source: Samaradiwakara and Gunawardena (2014)

Focusing on the Innovation Diffusion Theory (IDT) construct, first, the relative benefit is the degree to which an innovation is considered to be better than a precursor. Next, convenience of use is the degree to which innovation is perceived to be difficult to implement. Results demonstrability is the tangibility of the results of utilising the innovation, along with their observability and communicability. Tribality is the degree of innovation that can test experiments without a huge investment. On the other hand, visibility is the degree to which one can see others through an organisation system. Image is the degree to which one’s image or status in one’s social system; the use of an innovation is perceived to enhance the usage. Compatibility is the degree to which an innovation is perceived as being persistent with the current values, needs, and past experiences of potential adopters. Voluntariness of use is the degree to which the use of the innovation is perceived as being voluntary, or optional. The theory is illustrated in Figure 1.

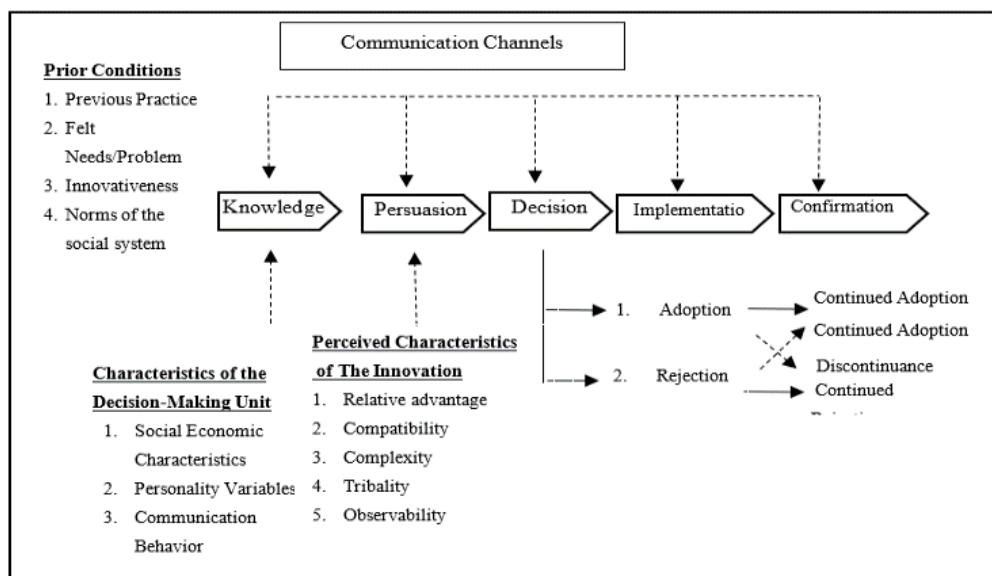


Figure 1: Innovation Diffusion Theory (IDT)

Source: Rogers (1962)

Theory of Reasoned Action (TRA)

The first theory that undergoes evolution is the Theory of Reasoned Action (TRA). This theory was designed by Martin Fishbein in the late 1960s, as TRA provided a useful model that could explain and predict the actual behaviour of an individual. It was revised and expanded by Fishbein and Ajzen in 1975. Fishbein and Ajzen (1975) suggested that the actual behaviour of the individual could be determined based on his or her previous purpose including the beliefs that the individual will have for the behaviour in issue (Chuttur, 2009; Davis, 1989).

TRA is a general model that is not designed to analyse specific behaviour or technology (Davis, Bagozzi, & Warshaw, 1989; Momani & Jamous, 2017). TRA originates from social psychology which defines the determining factor intentionally deliberate behaviour (Ajzen, 1991; Mei, Wai, Ahamad, & Zen, 2017). In the use of new technology, intention behaviour is resulted in the making behaviour to use or reject it, and this intent behaviour has affected by combining individual attitudes. These behaviours are committed to strong beliefs and instinctive norms of intentional behaviour (Ambali, 2014; Hee, 2000).

The theory was constructed using the two (2) core constructs: attitudes and subjective norms. Two components are influencing the attitudes: evaluation and strength of a belief. Meanwhile, in the subjective norm, there are two (2) components also influencing subjective norms: normative and motivation to comply. Both attitude and subjective norms explain the behavioural intention and actual behaviour (Davis, 1989; Wayne, 2018). Table 3 present the pertaining core constructs.

Table 3: Core Constructs of Theory of Reasoned Action (TRA)

Theory/Model	Constructs	Moderators
Theory of Reasoned Action (TRA)	1. Attitude toward behaviour 2. Subjective norm	1. Experience 2. Voluntariness

Source: Samaradiwakara and Gunawardena (2014)

TRA could represent in the context means it is determined that a user who has a conscious purpose of using a resolute information system, derivative from the use attitude, which may be positive or negative, followed by instinctive norms, which are referred to the perception that the user has of the other people's views (Buabeng-Andoh, 2018). Factors that unite the attitudes are the beliefs that apply to the knowledge that the subject has about a purposeful object and the instinctive standards, that is, the perception of an extrinsic evaluation of whether or not the action has been decided (Ajzen, 1991; Davis, Bagozzi, & Warshaw, 1992). Determinates of intentions are not limited to perspective, instinctive norms, and perceived behavioural control, and few factors influence human behaviour, i.e., behavioural beliefs, outcomes evolutions, non-norm beliefs and motivation to adhere to (Ahmed, 2016; Ajzen, 1991). The theory is shown in Figure 2.

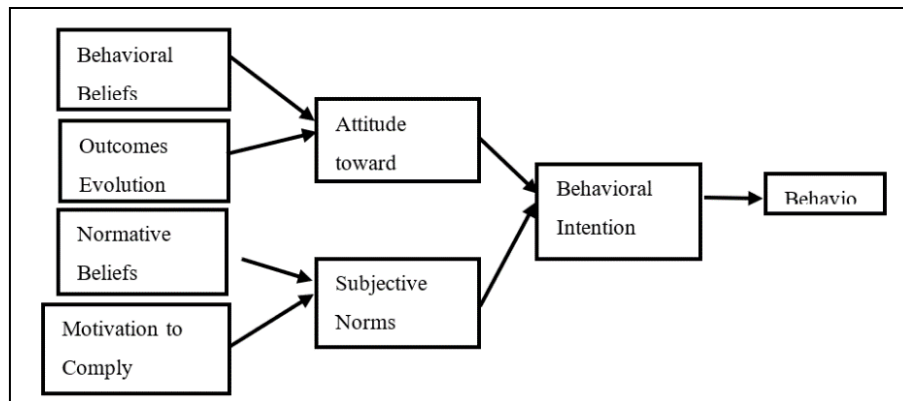


Figure 2: Theory of Reasoned Action (TRA) Model

Source: Fishbein and Ajzen (1975)

Social Cognitive Theory (SCT)

Miller and Dollard (1941) came up with the concept of Social Learning Theory (SLT) and postulates that learning occurs in a social environment with a non-static and similar interaction of the person, environment and behaviour (Agu, Nwankwo, Obi, Sydney-Agbor, & Mgbenkemdi, 2013; Momani & Jamous, 2017; Wayne, 2018). Aim of the SCT is to emphasise how people adjust their behaviour through control and motivation to achieve goal-oriented behaviour that can be attained over a period of time (Wayne, 2018). Five (5) core constructs have been developed in the original SCT, which is the SLT: reciprocal determinism, behavioural ability, observational learning, reinforcements and expectations (Wayne, 2018). Table 4 explains what is SCT.

Table 4: Core Constructs of Social Cognitive Theory (SCT)

Theory/Model	Constructs	Moderators
Social Cognitive Theory (SCT)	<ol style="list-style-type: none"> 1. Reciprocal determinism 2. Behavioural ability 3. Observational learning 4. Reinforcements 5. Expectations 	None

Source:

Samaradiwakara and Gunawardena (2014)

Focusing on the SCT construct, the reciprocal determinism construct refers to the individual level of interaction that involved the external social context experiences, and this is to encourage behaviour reaching the goal (Bandura, 1989, 2001; Compeau & Higgins, 1995; Sharma & Mishra, 2014; Stajkovic & Luthans, 1998; Wayne, 2018). Meanwhile, behavioural ability refers to individual behavioural performance through awareness and skills. Next, observational learning examines how people witness and observe the actions of others. On the other hand, the reinforcement contract is an internal and external response to another person's behaviour, that may be positive or negative, which is compatible with the relationship between behaviour and environment. Lastly, expectations refer to consequences

outcome expectation it can be health-related or non-health-related and the consequences will influence the behaviour, which means that the outcome of the consequences will give impact on behaviour as it largely derives from the experience. Figure 3 depicts the Social Cognitive Theory (SCT).

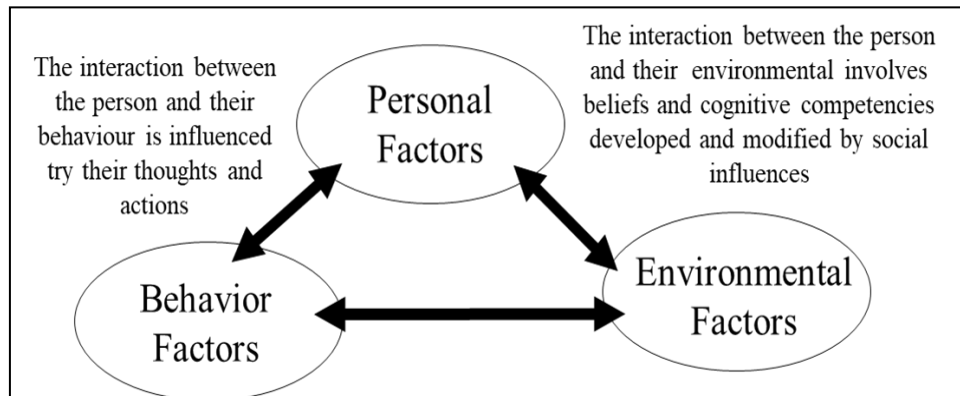


Figure 3: Social Cognitive Theory (SCT) Model

Source: Bandura (1989)

Technology Acceptance Model (TAM) & Technology Acceptance Model 2 (TAM2)

With vast technology direction in the 1970s and increasing failures of system adoption in associated organisations, the use of forecasting systems has been a field of concern for many researchers. However, most of the studies carried out did not work to produce reliable outcomes that could explain system acceptance or rejection (Chuttur, 2009; Mohtar, Hassan, & Hasnan, 2013; Yousafzai, Foxall, & Pallister, 2010). Originally based as TRA, Technology Acceptance Model (TAM)'s original model suggests that when users are shown with a new breed of technology, several factors influence their decision as to how and when they can use it. The degree to which a person believes that using a particular type of method would double up their job performance is perceived as useful (Davis, 1989). Perceived ease-of-use was the degree to which a person believes that using a particular system would be effortless and hypothesised to be influenced by the system design characteristics (Davis, 1989). They are represented by X1, X2 and X3 in the conceptual model, as shown in Figure 4.

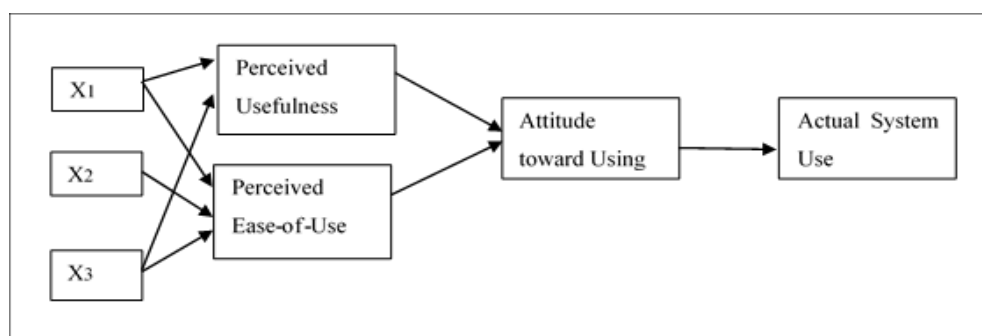


Figure 4: Original TAM Source: Davis (1989)

According to Chuttur (2009), in 1989, Davis called for the TRA model to be implemented and adapted to the context of user's acceptance of the information system in developing his own Technology Acceptance. TRA's behavioural approach has improved with two (2) technology acceptance measures or core factors which are: perceived usefulness and perceived ease of

usage. Thus, TAM did not include, in its nature, the subjective norms of the TRA, the core structure of the subjective norm included in TAM2 only (Momani & Jamous, 2017). The TAM model suggested that a person's actual attitude could be decided by considering his or her primary objective along with beliefs that a person has before actual behaviour (Davis, 1985; Sommer, 2011). Figure 5 indicates the finalised model of the TAM, which was proposed by (Davis, 1989) and Table 5 shows the summary related core construct.

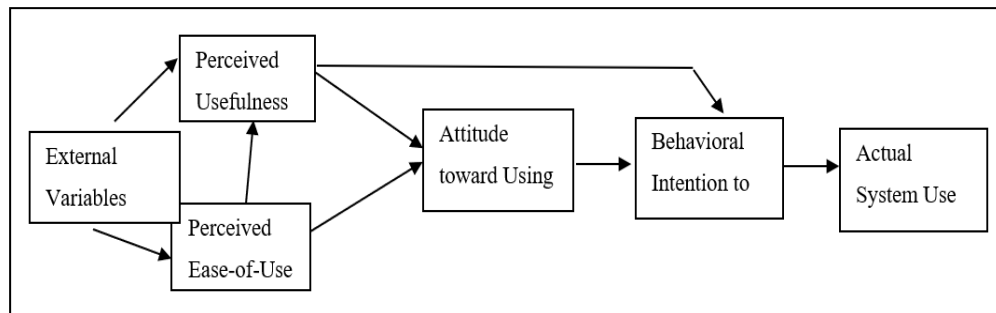


Figure 5: Technology Acceptance Model (TAM)

Source: Davis (1989)

Table 5: Core Constructs of Technology Acceptance Model (TAM)

Theory/Model	Constructs	Moderators
Technology Acceptance Model (TAM)	1. Perceived usefulness 2. Perceived ease of use	1. Gender 2. Experience

Source: Sharma and Mishra (2014)

TAM has been consistently researched and expanded the two (2) significant upgrades to TAM 2 (Venkatesh & Davis, 2000; Who, 2011). Using TAM as a starting point, TAM2 includes two (2) theoretical processes that cover social influence processes and cognitive instrumental processes that describe the impact of multiple determinants on perceived usefulness and behavioural intention (Venkatesh & Bala, 2008; Venkatesh & Davis, 2000). In The subjective standard in TAM2 is the determinants of perceived usefulness that reflect the process of social influence. In addition, cognitive instrumental processes have been introduced, namely job relevance, output quality, result demonstrability, and perceived ease of use (Venkatesh & Davis, 2000). Table 6 reports the Extended Technology Acceptance Model 2 (TAM2).

Table 6: Core Constructs of Extended Technology Acceptance Model 2 (TAM2)

Theory/Model	Constructs	Moderators
Technology Acceptance Model 2 (TAM2)	1. Perceived usefulness 2. Perceived ease of use 3. Subjective norm	1. Experience 2. Voluntariness

Source: Samaradiwakara and Gunawardena (2014)

Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) initially known as the Theory of Reasoned Action (TRA), and in 1991 Ajzen developed the TPB which is an extension of the border condition of pure volitional control defined by the TRA (Alam & Sayuti, 2011; Ketabi, Ranjbarian, & Ansari, 2014; Kiriakidis, 2015). The TPB forecast an individual's objective to interfere in a behaviour at a

specific time and place (Ajzen, 1991, 2002; Fishbein & Ajzen, 1975, 1977, 1980; Madden, Ellen, & Ajzen, 1992). The TPB distinguishes between the three types of beliefs-behavioural, normative, and control-and between the related constructs of attitude, subjective norm, and perceived behavioural control (Ajzen, 1991; Madden et al. 1992). Figure 2.6 shows a copy of the TPB which was offered by (Ajzen, 1991).

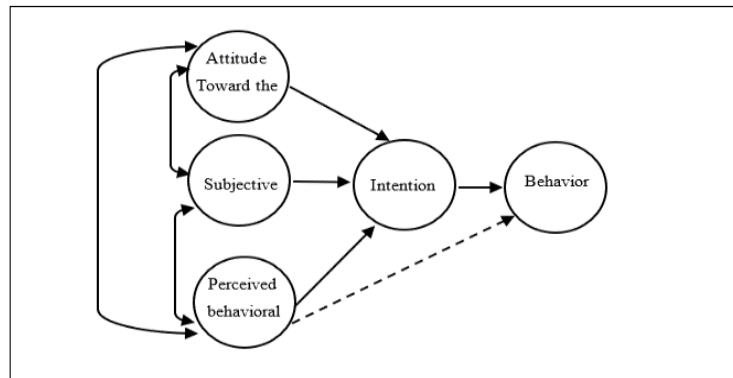


Figure 6: Theory of Planned Behaviour (TPB)

Source: Ajzen (1991)

Three (3) core constructs embedded in TPB includes the constructs of attitude and subjective norm (Glanz, Rimer, & Viswanath, 2008). The key difference between the TRA and TPB is the inclusion of the third deciding element of behavioural intention, which is viewed as behavioural control. PBC is determined by two following factors of controlled beliefs and perceived power (Tavallaee, Shokouhyar, & Samadi, 2017). Table 7 explains the attributes of the TPB.

Table 7: Core Constructs of Theory of Planned Behaviour (TPB)

Theory/Model	Constructs	Moderators
Theory of Planned Behaviour (TPB)	1. Attitude toward behaviour 2. Subjective norm 3. Perceived behavioural control	1. Gender 2. Experience 3. Age

Source:

Samaradiwakara and Gunawardena (2014)

Model of PC Utilization (MPCU)

The Model of PC Utilization (MPCU) was developed by Thompson, Higgins, and Howell (1991). MPCU differs from the Theory of Reasoned Action as it distinguishes between cognitive and affective components of attitudes (Marsh & Wallace, 2005; Sharma & Mishra, 2014) The MPCU theory recommends that the usage of computer by the worker is most likely to be influenced by a number factors, such as his feelings (affection) towards handling PCs, frequent social norms regarding the use of PC at the workplace, old habits related to computer usage, repercussions expected by the user using the PC and extent of environment that are present at the workplace to encourage the use of PC (Sharma & Mishra, 2014).

According to MPCU theory, behaviour is controlled by an attitude of what would it be like the individual to do, in social norms what will the individual thing to do and for habits what the individual usually has done and by the expected consequences of their behaviour (Sharma & Mishra, 2014). Habits as one-factor influencing behaviour; however, authors did not include habits within this study because there was not a clear distinction between the independent variables (Thompson et al., 1991). Figure 7 constructs the model of Personal Computer Utilization. Table 8 explains the attributes of the Theory of Model of PC Utilization (MPCU).

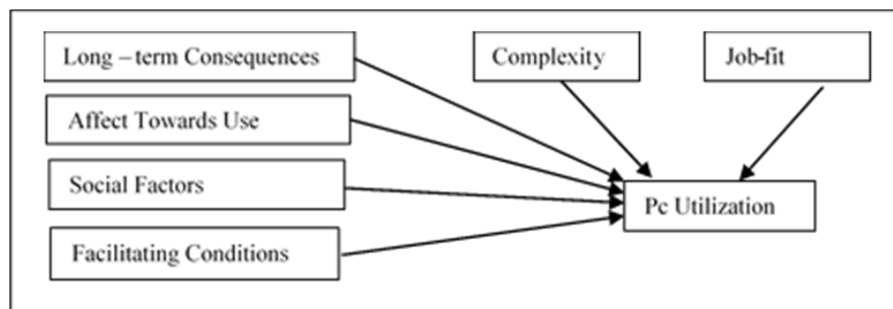


Figure 7: Model of Personal Computer Utilization (MPCU)

Source: Thompson, Higgins, and Howell (1991)

Table 8: Core Constructs of Model of PC Utilization (MPCU)

Theory/Model	Constructs (Independent variables)	Moderators
Model of PC Utilization (MPCU)	<ol style="list-style-type: none"> 1. Job fit 2. Complexity 3. Long Term consequences 4. Affect towards use 5. Social factors 6. Facilitating conditions 	<ol style="list-style-type: none"> 1. Experience

Source: Samaradiwakara and Gunawardena (2014)

Motivational Model (MM)

In order to study information technology adaptation and usage (Sharma & Mishra, 2014), the Motivation Model (MM) was developed by (Davis et al., 1992). The main assumption of the Motivation Model is that there are outer and natural motivations that blend the behaviour of the user. These are the two (2) significant factors of motivations: extrinsic motivation and intrinsic motivation (Davis et al., 1992; Momani & Jamous, 2017). Extrinsic motivation is described as an acknowledgement that users want to be involved and perform an action because it is perceived to be instrumental in achieving valued outcomes that are distinct from the operation itself, such as increased job efficiency, pay, or promotions (Davis et al., 1992; Sharma & Mishra, 2014). Perceived usefulness, perceived ease of use, and subjective norm are examples of extrinsic motivation (Sharma & Mishra, 2014). However, an example of intrinsic motivation is the extent of enjoyment that a person derives from playing with a computer (Davis et al., 1992; Venkatesh & Davis, 2000). On the other hand, if performing an activity leads to a sensation of enjoyment resulting towards an individual's satisfaction, such behaviour can be classified as intrinsic motivation (Vallerand, Pelletier, Blais, Briere, Senecal, & Vallieres, 1992). Table 9 summarises the core constructs of the MM.

Table 9: Core Constructs of Model of Motivational Model (MM)

Theory/Model	Constructs	Moderators
Motivation Model (MM)	1. Extrinsic motivation 2. Intrinsic motivation	None

Source:

Samaradiwakara and Gunawardena (2014)

Combined TAM and TPB Theory (C-TAM-TPB)

The TAM and TPB model were combined by Taylor and Todd (1995) with the purpose to examine closer consumer actual behaviour towards the acceptance of new technology (Momani & Jamous, 2017; Tavallaee et al., 2017). TPB constructs are attitude, subjective norm, and perceived control meanwhile TAM constructs are perceived usefulness and perceived ease of use. In comparison to the C-TAM-TPB model, subjective norm and perceived behaviour control added, this is intended to offer a detailed test of the essential determinants of IT usage (Momani & Jamous, 2017; Ahmed, 2016).

C-TAM-TPB is a suitable model for users who use technology system who have an experience and not (Ahmed, 2016). Generally, TAM provided an adequate IT usage model for both experienced and inexperienced users, accounting for a reasonable proportion of the intention and behaviour variance (Taylor & Todd, 1995). Results also suggest that there are some significant differences in the relative influence of the determinants of usage depending on experience and there was a more vital link between behavioural intention and behaviour for the experienced users (Momani & Jamous, 2017; Taylor & Todd, 1995). However, inexperienced users' intentions were better predicted by the antecedent variables in the model that were the intentions of experienced users. This suggests that communicating information to inexperienced users can have a substantial effect on intentions but it will not entirely translate to behaviour (Taylor & Todd, 1995). Figure 8 shows the C-TAM-TPB and Table 10 review of core constructs the C-TAM-TPB.

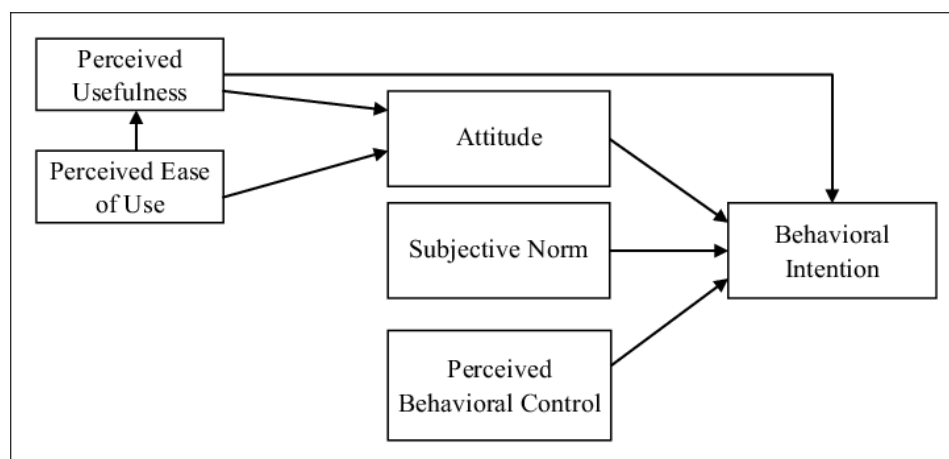


Figure 8: Combination of Technology Acceptance and Theory of Planned Behaviour Models (TAM-TPB)

Source: Taylor and Todd (1995)

Table 10: Core Constructs of Combined TAM and TPB Theory (C-TAM-TPB)

Theory/Model	Constructs (Independent variables)	Moderators
Combined TAM and TPB Theory (C-TAM-TPB)	1. Attitude toward behaviour 2. Subjective norm 3. Perceived behavioural control 4. Perceived Usefulness	1. Experience

Source: Samaradiwakara and Gunawardena (2014)

Unified Theory of Acceptance and Use of Technology (UTAUT)

Based on the acceptance and use of technology by end-users, the Unified Theory of Acceptance and Use of Technology (UTAUT) model is much enhanced and holistic. The UTAUT called as Unified model was formulated by combining multiple elements across eight models (Momani & Jamous, 2017; Sharma & Mishra, 2014; Venkatesh et al., 2003; Williams, Rana, & Dwivedi, 2015). The UTAUT is a detailed and useful tool for managers demanding to evaluate the capacity of success for new technology capabilities and help them to fully understand the factors of acceptance technology to proactively design barriers including training, marketing and-so-forth (Venkatesh et al., 2003). The purpose of UTAUT is to explain the intentions of the user to use an information system and the subsequent behaviour of users. UTAUT identifies four (4) key factors and four (4) moderators connected to predicting behavioural intention to use technology and actual technology used mainly in organisational contexts (Al-Qeisi, Dennis, Alamanos, & Jayawardhena, 2014; Alwahaishi & Snášel, 2013; Venkatesh et al., 2003).

According to Alwahaishi and Snášel (2013) and Venkatesh et al. (2003) performance expectations, effort expectancy and social influence have been out and said to affect the behavioural intention to use technology, while behavioural intention and facilitating environment determines the use of technology. Besides, various combinations of the four moderators were theorised and most likely to moderate various UTAUT relationships. The first three are direct determinants of objective use and behaviour, and the fourth is a direct determinant of user behaviour. Gender, age, experience, and voluntariness of use was structured to balance the impact of four (4) main factors on usage intention and behaviour. Figure 9 shows the above statement, and Table 11 explained of core constructs in UTAUT.

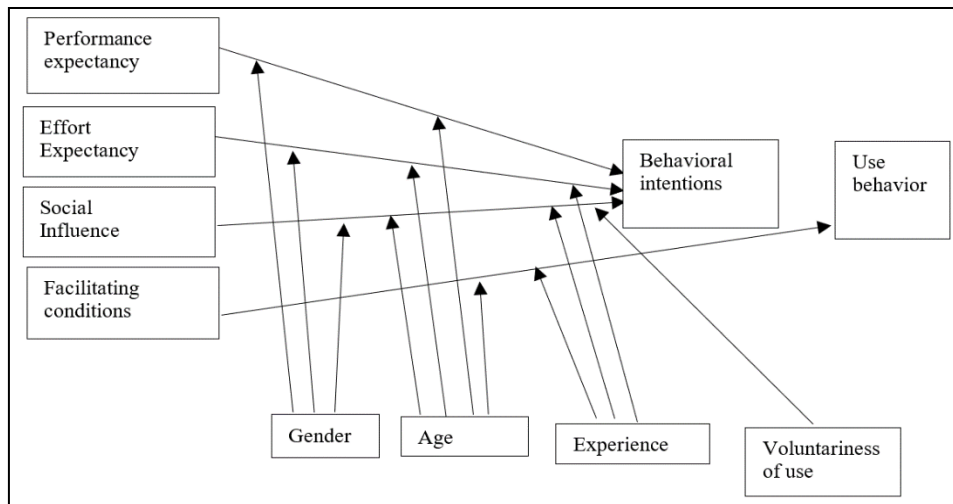


Figure 9: Unified Theory of Acceptance and Use of Technology (UTAUT) Model
 Source: Venkatesh, Morris, Davis and Davis (2003)

Table 11: Core Constructs of UTAUT

Theory/Model	Constructs (Independent variables)	Moderators
Unified Theory of Acceptance and Use of Technology (UTAUT)	1. Performance expectancy 2. Effort expectancy 3. Social influence 4. Facilitating conditions	1. Gender 2. Age 3. Experience 4. Voluntariness

Source: Samaradiwakara and Gunawardena (2014)

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

The extended version of the original UTAUT model is known as the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) (Chang, 2012; El-Masri & Tarhini, 2017; Xavier & Oliveira, 2016). UTAUT2 extends the complete theory of acceptance and use of technology UTAUT which consists of three elements into UTAUT: hedonic motivation, price value, and habit. Firstly, the inclusion of hedonic motivation which will support UTAUT's strongest predictor that highlights utility. Secondly, from a user's point of view, unlike workplace views, users are responsible for the costs and such costs, besides being important, can monopolise consumer adoption decisions (Khatimah, Susanto, & Abdullah, 2019; Venkatesh et al., 2012). Next, the price value complements UTAUT's current resource measures to concentrate only on time and effort. Lastly, putting together habits will complete the theory's focus on objectivity as the overarching mechanism and primary driver of behaviour (Venkatesh et al., 2012).

As compared to the UTAUT model, the extensions proposed in UTAUT2 produced a considerable improvement in the variance discussed in behavioural intention (Baptista & Oliveira, 2015; Huang & Kao, 2015; Venkatesh et al., 2003; Venkatesh et al., 2012). The variations between UTAUT2 and UTAUT are in three ways: (i) distinguishing three (3) key factors from past analysis on each general adoption and usage of technologies, and consumer adoption; (ii) sterilisation number of the present relationships around the original conceptualisation of UTAUT; and (iii) introducing new mutual relationships (Venkatesh et al., 2012). The inclusion of new variables has been very effective in extending the theoretical

horizons of the original UTAUT model (Baptista & Oliveira, 2015; Huang & Kao, 2015; Lai, 2017; Palau-Saumell, Forgas-Coll, Sánchez-García, & Robres, 2019; Venkatesh et al., 2012). UTAUT2 also integrates moderated relationships (moderated by age, gender, and experience, per the original UTAUT) with regards to the three new constructs (Venkatesh et al., 2012). Figure 10 depicts the UTAUT2 model and Table 12 explained of core constructs in UTAUT2.

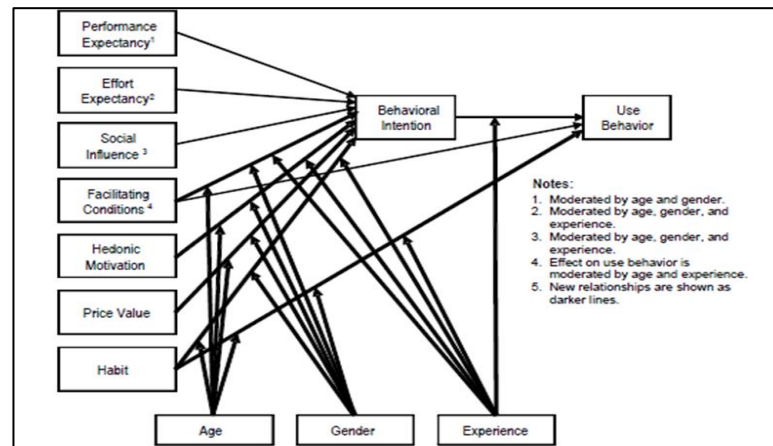


Figure 10: UTAUT2 Model
 Source: Venkatesh, Thong, & Xin (2012)

Table 12: Core Constructs of UTAUT

Theory/Model	Constructs (Independent variables)	Moderators
Unified Theory of Acceptance and Use of Technology (UTAUT)	1. Performance expectancy	1. Gender
	2. Effort expectancy	2. Age
	3. Social influence	3. Experience
	4. Facilitating conditions	4. Voluntariness

Source: Researcher findings

Comparison Between the Theoretical Models

Based on the integration process, it is clear that various theories and models involve different factors or attributes that can affect the consumer’s behavioural objective of using a particular technology in their individual activities (Venkatesh et al., 2016). Therefore, it is essential to explain each of these theories and models discretely, with the focus of identifying the factors and attributes used by them. This study briefly elaborated ten (10) models involved in the contraction of technology. According to Samaradiwakara and Gunawardena (2014), each theory has its advantages and ability. Therefore, it is necessary to compare them to identify which best suits their ability to predict and explain individual behaviour towards acceptance and use of technology. Table 1.3 provides a brief of the core contrasts of theories and models of technology adoption.

Table 1.3: Core constructs of theories and models of technology adoption

Theories	Core Constructs	Definitions
1. Innovation Diffusion Theory (IDT)	Relative Advantage	To the extent that innovation is seen to be better than its past practice
	Ease of Use	The extent of innovation that is challenging to use
	Results Demonstrability	Decision-making agility using innovation, including its visibility and capabilities'
	Tribality	Is the level of innovation that can test experiments without an enormous investment
	Visibility	The level at which others see the organization's system
	Image	To what degree innovation is used to improve one's image or status within one's social system
	Compatibility	To the extent that innovation is viewed according to potential recipient values, needs, and experiences
	Voluntariness of Use	To the extent that the use of innovation is deemed voluntary or free of charge
2. Theory of Reasoned Action model (TRA)	Attitude Toward Behaviour	An individual feeling which is evaluative affects behavioural performance
	Subjective Norm	Other perceptions toward behaviour perform.
3. Social Cognitive Theory (SCT)	Reciprocal Determinism	Consequences linked to performance in behaviour. The performance expectations specifically address work-related outcomes
	Behavioural Ability	Personal behavioural results. Personal presumptions particularly concern self-respect and a sense of achievement
	Observational learning	Judging one's ability to make use of technology (e.g., computers) to perform certain tasks
	Reinforcement Contract	A person's desire for certain behaviours
	Expectations	Surprise risky reactions
4. Technology Acceptance Model (TAM)	Perceived Usefulness	The level of individual believes it will help to improve their job performance by using a particular system.
	Perceived Ease of Use	The level of one believes a task performance would be effortless by using a particular structure.
Technology Acceptance Model2 (TAM2)	Perceived Usefulness	Adapted from TAM
	Perceived Ease of Use	Adapted from TAM
	Subjective norm	Adapted from TRA/TPB
5. Theory of Planned Behaviour (TPB)	Attitude Toward Behaviour	Adapted from TRA
	Subjective Norm	Adapted from TRA

	Perceived Behavioural Control	The difficulty of perceived ease performing behaviour
6. Model of PC Utilization (MPCU)	Job -Fit	The degree of belief in using technology will improve their performance at work
	Complexity	It is related in the context of innovation to the perceived difficulty of understanding and making use of
	Long-term Consequences	The result which affects or significance the future use
	Affect Towards Use	It is a result of feeling, enjoyment, dislike or the like related to acting in the use of the technology in Information System
	Social Factors	Influences which individuals absorb an idea from the community around them
	Facilitating Conditions	Objective environmental factors which the observers agree to facilitate action
7. Motivation Model (MM)	Extrinsic Motivation	Activity performance arises from the individual because a rewarding matter is gained
	Intrinsic Motivation	Activity performance that arises from an individual who doesn't need the reward. All that's done is based on curiosity and interest in them
8. Combined TAM and TPB (C-TAM-TPB)	Attitude Toward Behaviour	Adapted from TRA/TPB
	Subjective Norm	Adapted from TRA/TPB
	Perceived Behavioural Control	Adapted from TRA/TPB
	Perceived Usefulness	Adapted from TRA/TPB
9. Unified Theory of Acceptance and Use of Technology (UTAUT)	Performance Expectancy	Defined as the measurement to which the usage of technology will provide advantages
	Effort Expectancy	The degree of ease connected with consumer's technology utilisation, linked with the technology
	Social Influence	Defined as the benchmark to which an individual perceives that it is important for others to believe he or she ought to use the new system
	Facilitating conditions	Degree to which an individual believes that an organizational and technical infrastructure exists to support the system utilisation
10. Unified Theory of Acceptance and Use of	Performance Expectancy	Adapted from UTAUT
	Effort Expectancy	Adapted from UTAUT
	Social Influence	Adapted from UTAUT

Technology2 (UTAUT2)	Facilitating conditions	Adapted from UTAUT
	Hedonic motivation	The enjoyment and pleasure expect from shopping this is that the feeling knowledgeable about shopping
	Price value	Positive impact when the benefits of using technology are perceived as bigger than the monetary expense
	Habit	In technology use have outlined different fundamental processes by which habit influences technology use aviation of habit as prior use

Source: Researchers' findings

This study found that each of the models has its limitations and boundaries (Momani & Jamous, 2017). Each theory is limited and does not mutually complement the rest of the models. There are two significant concerns linked to those theories' acceptance. First, each theory utilises distinct terminologies in its constructs, but they are fundamentally under the same concepts. Secondly, according to the complication of behavioural findings and the limitation of scientists available, there is not even a single theory that includes all behavioural variables (Momani & Jamous, 2017; Qingfei, Shaobo, & Gang, 2012). Table 14 explained the limitations of these models of technology adoption, as per argued by other researchers.

Table 14: Limitations of Theories and Models of Technology Adoption

Theories	The Limitations of Reviewed Theories
Innovation Diffusion Theory (IDT)	The theory then explains the results of innovation factors and predicts the rate of innovation, but this theory did not mention how the attitudes affect the decision of acceptance and rejection meaning how innovation influences the decision, this can sum up that this theory does not care about individual resources or social support for new behaviours
Theory of Reasoned Action (TRA)	This resulted in a general model that was not designed for a certain behaviour or related technology, limited to predicting certain behaviours, and also intended to agree on a time for action, target, context, and prediction. In other words, this theory is limited because it fails to mention another variable that is affected by the intention of behaviour
Social Cognitive Theory (SCT)	It is organised irregularly especially when it concerns the study of the relationships between individual behaviour and the environment. Not really good at understanding which of these is more influential than the other. The study originally focuses on the learning process, not on motivation that affects behaviour, without taking past experience and expectations

Technology Acceptance Model (TAM) & Technology Acceptance Model2 (TAM2)	Both theories focus only result from two (2) core constructs without providing other variables that will shoot up the adoption of integration, flexibility, information richness, and dollars in information. The theory did not specify how beliefs influence behaviour
Theory of Planned Behaviour (TPB)	The model did not explain the individual's mechanism and how it relates to the model, the variables explained how other variables influenced behavioural intent and motivation
Model of PC Utilization (MPCU)	The theory explains the success in understanding the behaviour of users using computer behaviour but has not explained the complexity and indirect impact on perceived short-term effects
Motivational Model (MM)	The model applies only to students of motivation, learning and health care but is not effective in applying technology to use and acceptance
Combination of Technology Acceptance and Theory of Planned Behaviour models (combined TAM-TPB)	The combination did not take planning factors for the behaviours of an individual. Though subjective standard added from TPB and discerned ease of use from TAM added, but the theory was not fixed
Unified Theory of Acceptance and Use of Technology (UTAUT)	The theory excludes the subject of variance in behavioural intentions or driver of behaviour. This leads to the theoretical weakness in the most reinforced forecasters that the utility is stylish. Lack of user usage results that cannot measure and focus only on time and effort

Source: Researchers' findings

As of its limitations, that is why the evolution of the Technology Acceptance Model took place and from these limitations it can be concluded that UTAUT2 is the best and latest model to use.

Discussion

Based on the above comparison, it is essential to highlight that the IDT explains results and factors of innovations and predicts the rate of the innovation, however, this theory did not mention how the attitudes affect the decision of acceptance and rejection meaning how the innovation influence the decision. This can summarise that this theory does not care individual resources or social aid for new behaviours. Meanwhile, TRA is a model that is not designed for a specific behaviour or related technology, this resulted in limitation to predict certain behaviour, and also intend to agree about action, target, context, and prediction time. Also, it can be concluded that this theory is limited because it fails in mentioning another variable that affected by behaviour intention. Meanwhile, both TAM and TAM2 only focus on result from two core constructs without providing other parts that will stimulate the adoption of integration, flexibility, information completeness, and information currency, the theory did not specify how beliefs influence behaviour.

Meanwhile, the TPB did not explain the mechanism of the individual and how it is related to the model. The variables did explain how other variables that affected behavioural intention and motivation. The MPCU theory explains the success in understanding user's behaviour using computer behaviour but did not explain the complexity and indirect impact on perceived short-term consequences. The MM model only viable applications were on students of motivations, learning and health care but not effective in the application on technology utilisation and acceptance. Lastly, the combination of TAM-TPB did not take factors of planning for an individual's behaviours. Although subjective norm added from TPB and perceived ease of use from TAM were added, it did not fix or enhanced the theory.

In conclusion, the Theory of Reasoned Action (TRA) suggested by Fishbein and Ajzen (1975) had been described as adaptable behavioural theory and models the attitude-behaviour relationships, which then was applied to the Theory of Planned Behaviour (TPB), also by Ajzen (1991). The TPB is famous for foretelling an individual's purpose to participate in the behaviour at a specific time and place. Taylor and Todd (1995) extended the TPB by combined with TAM into Combined TAM and TPB (C-TAM-TPB). The C-TAM-TPB model is used to understand the influence of social and control factors on consumer behaviour. On the other hand, researchers from the information systems area utilized the TRA and Davis (1989) proposed the Technology Acceptance Model (TAM). This model involves psychological factors affecting technology acceptance. Next, Venkatesh and Davis extended Technology Acceptance Model (TAM2). TAM2 covers social influence processes and cognitive instrumental processes to explain the effects of the various determinants on perceived usefulness and behavioural intention.

Next, Venkatesh, Morris and Davis (2003) proposed the Unified Theory of Acceptance and Use of Technology. The development of UTAUT aims to clarify the intentions of the user to utilise an information system and the next behaviour of users. Other than that, in the year 2012, Venkatesh, Thong and Xu extended the UTAUT model into the UTAUT2 model by integrating four models: The Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), Motivational Model (MM) and Model of PC Utilization (MPCU). Figure 10 below explain the evolution process between the previous technology-related models.

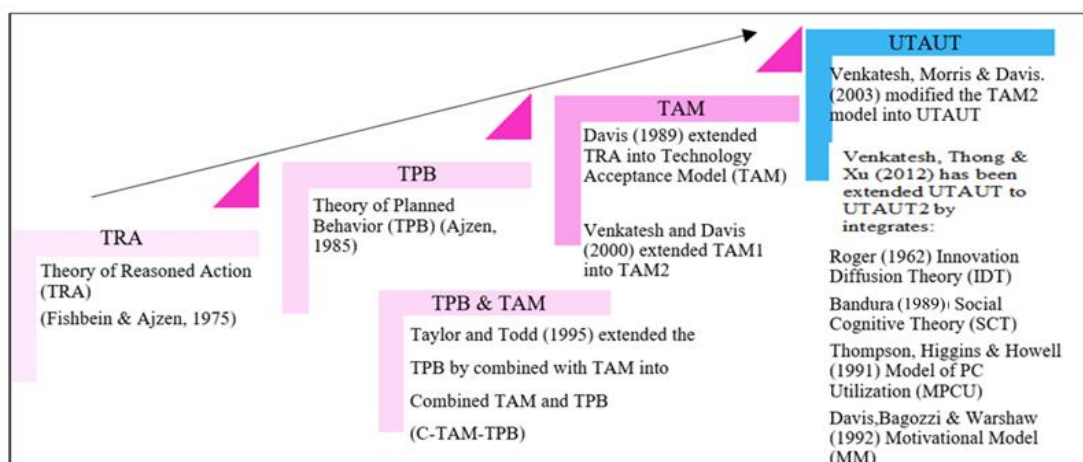


Figure 10. Evolution Process Between the Previous Technology-Related Models

Source: Researcher findings

Based on the review, it is clear that various theories and models have different factors or attributes that can affect the consumer's behavioural goal to use a particular technology in their specific activities (Venkateshet al., 2016). Therefore, it is essential to explore each of these theories and models thoroughly discretely, with the focus of identifying the factors and attributes used by them.

Conclusion

The outcomes of this study through the systematic review are as such: (1) the technology acceptance model behaviour combines consumer behaviour theory into technology framework (2) there has been a steady development of the technology acceptance model starting from the IDT in 1962 to the new UTAUT2 theory in 2012; (3) Most of the customer acceptance theory includes moderating variables due to the complexity of consumer behaviour; (4) every single theory or model has its weaknesses and strengths; (5) The reviewed literature on technology acceptance theories/models confirmed that they have different premises and benefits; and (6) UTAUT2 is considered as the most comprehensive model in the consumer technology adoption and usage research. From the analysis, it can be concluded that UTAUT2 has played a crucial role in technology acceptance research and provides a sound foundation for understanding whether consumers adopt or oppose technology from a particular viewpoint. The technology acceptance model has been widely implemented in a vast array of research studies in technology contexts and other various areas of academic interest. Besides, they have also proven their improved applicability to the adoption of modelling technology in diverse contextual settings.

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