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A Comparative Analysis of Various Information Systems Acceptance Models

F.H. CHANDIO, H.A. NIZAMANI, Q.U.A. NIZAMANI, S. VIGHIO*, M.S. CHANDIO

Institute of Maths and Computer Science, University of Sindh, Jamshoro, Pakistan
Email:hanizamani@gmail.com : q_agro@hotmail.com: saleem.vighio@quest.edu.pk mschandio@gmail.com
Corresponding author: F.H. CHANDIO, Email: chandiofida@gmail.com Ph. No. +92-229213177

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Abstract: Since the inception of information systems (IS), there has been an ongoing quest among the research community to find those factors that influence users to accept and to make use of such systems. This issue is of particular importance for organisations because by understanding influencing factors, management will be able to understand users' perceptions and intentions towards a given IS. Besides, this will also enable system designers and developers to enhance the use and acceptance of newly developed systems through focusing on user-centred design choices. Over the decades, researchers have been investigating the factors predicting user acceptance of information systems / information technology using various theories and models. This article presents a comparative analysis of the models which have been consistently used to understand acceptance of various information systems.

Keywords: Information Systems Acceptance, TAM, TRA, TPB

1. INTRODUCTION

Recently, the adoption of technology in organisations has grown immensely. In 1999, it was estimated that annual worldwide expenditures on IT may exceed one trillion US dollars per year and it was predicted to be growing at about 10 per cent compounded annually (Seddon et al., 1999). Further, studies have shown that investment in IT has consumed about half of total capital investment of organisations since 1980's (Venkatesh *et al.*, 2003). However, the consequential benefits of such investments on the development of IT systems are not guaranteed, until these systems are not accepted and utilised by the intended users (Venkatesh and Davis, 1996). Hence, there is a need to know why people are keen or reluctant in using new information systems in order to figure out practical methods of evaluating and assessing new IT systems, to forecast the user response and acceptance of IT systems along with the implementation of these systems (Davis, 1989).

Literature has confirmed an individual's 'intention' as a significant predictor of the acceptance and usage of new IT systems (Venkatesh and Morris, 2000; Fishbein and Ajzen, 1975; Davis, 1989; Davis et al., 1989) and suggested models that have theoretical base in social psychology. These intention-based models use behavioural intention to predict information system acceptance and usage (Taylor and Todd, 1995). These theoretical models are theory of reasoned action (TRA), theory of planned behaviour (TPB), and technology acceptance model (TAM).

The TRA developed by Fishbein and Ajzen (1975) has established as a successful theory in explaining and predicting IT usage behaviour across a broad range of domains. However, due to its limitations on volitional control, Ajzen in 1991 extended TRA by including an additional construct i.e. perceived behavioural control (PBC). This construct predicts both behavioural intentions to use as well as the actual use behaviour. The extended model is called the Theory of Planned Behaviour (TPB). Empirical studies (Mathieson, 1999; Taylor and Todd, 1995) showed the appropriateness of using the TRA and the TPB theories for studying the determinants of IT usage behaviour. The TAM developed by Davis in 1986 is an information system theory adapted from the TRA specifically designed for modelling user acceptance of an IS. The TAM is one of the most widely used models to explain user acceptance of new IS/IT systems (Venkatesh and Davis, 2000).

2. Theory Of Reasoned Action

The Theory of Reasoned Action (TRA: Fishbein and Ajzen, 1975) is an intention model developed from social psychology that explains the determinants of users' behaviour in question (Ajzen and Fishbein, 1980). The main goal of this theory is "to

*Department of Information and Technology, Quaid-e-Awam University, Nawabshah, Pakistan

predict and understand an individual's behaviour" (Ajzen and Fishbein, 1980, p.5). The foundations of the TRA lie in the assumption that behaviour of the users is rational and that the users evaluate the existing data systematically. In other words, the TRA suggests that individuals take into consideration the implications of their activities before performing any specific behaviour (Ajzen and Fishbein, 1980). A model of TRA is illustrated in (**Fig.1**).

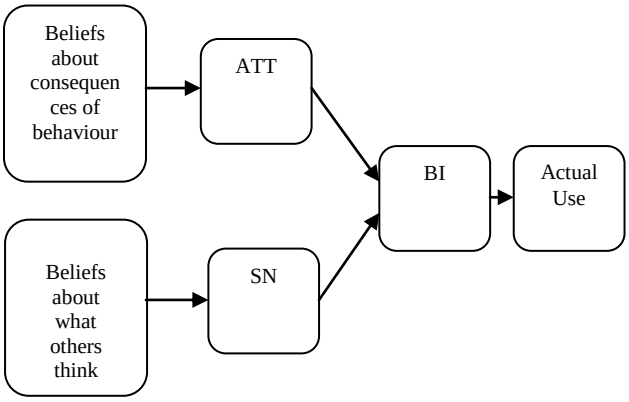

Fig. 1 TRA (Fishbein and Ajzen, 975)

According to Ajzen and Fishbein (1980), the theory of reasoned action posits that "most behaviours of social relevance are under volitional control and are thus predictable from intention" (p. 4). The model of TRA, as shown in the (**Fig. 1**), defines relationships among beliefs, norms, attitudes, intended behaviour, and actual behaviour. In the TRA, attitudes and subjective norms affect individual's intention, which predicts the behaviour of the person. Attitude refers to individual's negative or positive assessment of the behaviour in question (Fishbein and Ajzen 1975), while subjective norm, a social influence factor, refers to individual's perception of social pressure to perform or not to perform the specific behaviour (Fishbein and Ajzen 1975). Therefore, the TRA comprises two core constructs i.e. attitude and subjective norms, which are defined in **(Table 1).** This can be summarised as BI = A + SN.

The TRA has been broadly applied and tested in various studies to predict and explain the performance of behaviour both the intended and the actual (Davis et al., 989). However, by the time this theory was applied in various academic disciplines, researchers realised that this theory was not sufficient and there were several limitations when it was applied in particular contextual settings (Davis et al., 1989; Ajzen, 1991). Davis et al. (1989) suggested that TRA is general behavioural theory and it does not point out what particular beliefs would be appropriate in particular situations.

Furthermore, the TRA theory was criticised for being unsuitable to predict situations where individuals have low levels of volitional control (Ajzen, 1985). To address these limitations, Ajzen in 1991 extended the TRA and proposed a new theory called theory of planned behaviour (TPB), which is discussed in the next section.

Core Constructs	Definition	Author
Attitude	refers to individual's negative or positive evaluation of the behaviour.	Fishbein and Ajzen (1975)
Subjective Norm	Refers to individual's perception of social pressure to perform or not to perform the behaviour.	Fishbein and Ajzen, (1975)

Table 1 Core constructs in TRA

Theory Of Planned Behaviour

The Theory of Planned Behaviour (TPB) is an extension of the TRA (Ajzen, 1991) and the later (TRA) was proposed to study individuals' behaviour in situation in which they had no control over the performed behaviour (Mathieson, 1999; Ajzen, 1991). Ajzen (1991) added the perceived behavioural control (PBC) construct in the TRA model to accommodate situation in which individuals' lacked full volitional control. The PBC was therefore seen as an ease or difficulty in performing a particular behaviour (Ajzen, 1991). Therefore, the TPB that is another intention model established from social psychology (**Fig.2**) suggests that PBC factor, subjective norms (SN), and attitudes (ATT) are direct determinants of intentions to use (IU) and the actual usage behaviour (AB). Thus, the TPB suggests that attitude, social influence factor SN, and PBC jointly determine the intended and actual behaviour (AB). Additionally, the construct PBC was postulated to have causal relationship with both the intention to use and the actual usage.

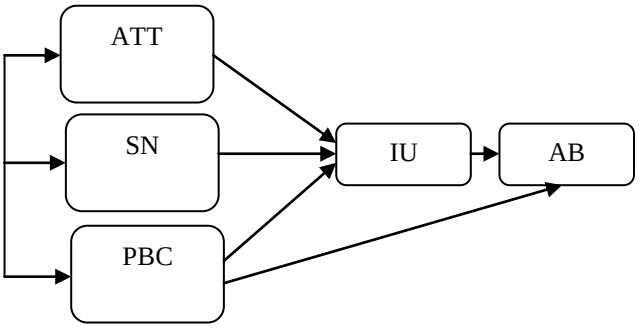

Fig.2 Theory of Planned Behaviour

Researchers have applied the TPB in a variety of situations in order to predict the performance of intentions and actual behaviour, such as, predicting user

intentions to use new IS systems and to perform unethical behaviour (Mathieson, 1991). While comparing predictive power of TPB and TRA, (Mathieson, 1991) suggested that the TPB has an upper hand over the TRA in terms of predictive power of actual behaviour. The major difference between the TPB and the TRA is that the TPB added an exogenous variable i.e. perceived behavioural control, which has direct and indirect effect on actual behaviour through intention.

Although previous information system research studies suggested that perceived behavioural control may be an important predictor of intentions to use and actual usage (Mathieson, 1991; Taylor and Todd ,1995); there is however empirical evidence that suggests that with the behavioural control construct the role of self-efficacy is not only an important incorporation to the theory but it commonly emerges as the most significant factor influencing both behavioural intention to use and actual behaviour. (**Table 2)** provides the definitions of the core constructs included in the TPB.

Table 2 Core Constructs In TPB

Core Constructs	Definition	Author
Behavioural Intention	refers to individual's intention to perform behaviour and is a function of Attitude, Subjective Norm and Perceived Behavioural Control.	Fishbein and Ajzen (1975); Ajzen (1991); Mathieson (1999)
Attitude	refers to individual's negative or positive evaluation of the behaviour.	Fishbein and Ajzen (1975); Ajzen (1991); Mathieson (1991)
Subjective Norm	refers to individual's perception of social pressure to perform or not to perform the behaviour.	Ajzen (1991); Mathieson (1999)
Perceived Behavioural Control	refers to the perceived ease or difficulty of performing the behaviour and reflects.	Ajzen (99); Mathieson (1999)

3. Technology Acceptance Model

The technology acceptance model (TAM), developed by Davis (1989) (**Fig.3**), is one of the most widely applied models used to explain the individual's acceptance of information systems. The TAM is an information systems (IS) theory adapted from the theory of reasoned action (TRA), which was specifically designed for modeling acceptance of information systems by potential users. The primary purpose of the TAM is to predict IS/IT acceptance and diagnose design problems before users actually use new systems. Therefore, the TAM has been widely used for the purpose of predicting, explaining and increasing the understanding of user acceptance of information systems in various fields.

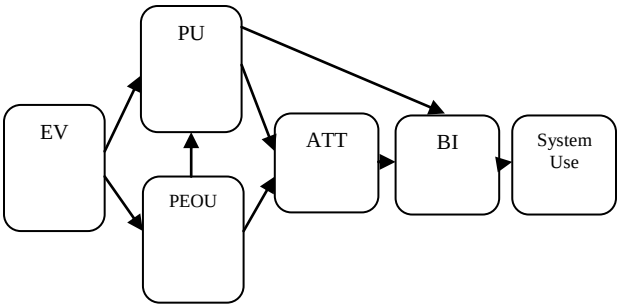

Fig. 3 Technology Acceptance Model (TAM: Davis, 989)

The TAM model suggests that when individuals encounter new IS technologies, two main variables influence how and when individuals will use the system. These variables of the TAM are perceived usefulness (PU) and perceived ease of use (PEOU). PU is referred as "the degree to which person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p.320). PEOU is defined as "the degree to which a person believes that using a particular system would be free from efforts" (Davis, 1989, p.320). The TAM proposes that PU and PEOU beliefs affect users' attitude towards using information systems. Their attitude directly relates to behavioural intention (BI) to use, which, in turn, will determine usage of the system. PU and PEOU both have an effect on BI. PEOU also affects PU. BI is also indirectly influenced by external variables through PU and PEOU.

However, the original TAM (Davis, 1989) was revised by omitting attitude from the model. Davis et al. (1989) conducted an empirical study among MBA students using word processing application. The results of their study partially supported the model. They found that attitude did not fully mediated perceived ease of use and perceived usefulness. Therefore, they recommended a revision of the original TAM model which they claimed was a more "powerful for predicting and explaining user behaviour, based on only three theoretical constructs: Behavioural intention (BI), perceived usefulness (PU), and perceived ease of use (PEOU)" (Davis, 1989). In addition, Davis and Venkatesh (1996) empirically proved that BI to use is only partly mediated by the attitude. The revised TAM is illustrated in **(Fig.4)**.

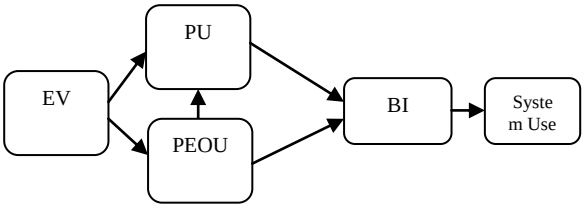

Fig.4 Revised Technology Acceptance Model (Davis, 1989)

The revised model of technology acceptance, proposes that BI is determined by PU and POEU. PU is determined by PEOU and external factors. PEOU is also hypothesised to have a direct effect on PU. In addition, external variables are postulated to have effect on core beliefs of TAM i.e. PU and PEOU. According to Davis et al. (1989) these external variables, as suggested in the TAM, could be system design features, personal characterises, training, and the like. (**Table 3)** shows definitions of the core constructs in the TAM.

Core Constructs	Definition	Authors
Perceived Usefulness	refers to the degree to which a person believes that using a particular system would enhance his or her job performance.	Davis (1989); Davis et al. (1989); Venkatesh et al. (2003)
Perceived Ease of Use	refers to the degree to which a person believes that using a particular system would be free of effort.	Davis (1989) ; Davis et al. (1989); Venkatesh et al. (2003)

Table 3 Core constructs of the TAM

Davis (1989) conducted various experiments to validate the TAM by using PEOU and PU as two independent variables to understand information system usage. He found that both constructs were significantly correlated with intended use and actual system usage. Although, the TAM was originally developed to test simple word processing software with students, Davis et al. (1989) described the core constructs (i.e. PU and PEOU) of the TAM as universal to varying types of information systems and user populations.

5. CONCLUSIONS

As there is growing use of new information system in organisational and personnel contexts; it appears that the issue of user acceptance should continue to be of great importance. This article provided an overview of various theories and models that have been used to understand and investigate knowledge regarding user acceptance of IS/IT. It was identified that among the theories/models used, the technology acceptance model has been applied extensively by the IS researcher. This was mainly because of its specific focus on IS/IT usage, parsimony, and validity and reliability of measuring instruments.

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