DIFFERENT TECHNOLOGY ACCEPTANCE MODELS/THEORIES

Models/Theories that try and ascertain as well as predict behavior, especially in the domain of Technology have been investigated by Researchers with a lot of vigour and over an extended period. The main objectives of this research is to understand how one can augment the uptake as well as investigating the reasons that prevent usage and intention to use the technology. Each prominent technology acceptance theory or model which has not been superseded by more recent research has different premises and benefits. It is therefore important to study them, since it is expected that theoretical concepts from these theories will help to provide a sound basis for the theoretical framework for evolving a research model that could assist in demonstrating the acceptance of Technology for this research (Kripanont, N., 2007).

This chapter will review eight prominent technology acceptance/social behaviour models/theories, which in brief are:

1. Innovation Diffusion Theory (IDT). Innovations Diffusion Theory (IDT) has been used since the 1950s to describe the innovation-decision process. It has gradually evolved until the best well-known innovation-decision process was introduced by E.M. Rogers. The innovation-decision process is one through which an individual (or other decision-making unit) goes through various stages.

2. Theory of Reasoned Action (TRA). This model forms the backbone of studies associate with attitude-behaviour relationships. The TRA postulates that one’s thinking affects one’s attitude and subjective norms. These factors then impact one’s behavioural intention, which in turn has a significant influence on one’s behaviour. Intention implies a sustained resolution towards a particular act, and as per this model is the predecessor of behaviour.

3. Technology Acceptance Model (TAM), deals with two key beliefs: perceived usefulness (PU) and perceived ease of use (PEOU) and users’ attitudes, intentions and actual technology usage behaviour. Perceived usefulness is a person’s evaluation of a particular innovation benefitting him, while perceived ease of use is his appreciation of adopting that particular innovation without any complications. Behavioural intention is,
as per this model, the predecessor of system usage. It is influenced directly by perceived usefulness and one’s attitude towards adopting that technology or innovation.

4. Technology Acceptance Model 2 (TAM2) was first introduced in 2000. The goal of TAM2 is a logical next-step of the Technology Acceptance Model (TAM) to firstly, include additional key determinants of TAM that explain the impact of social and other derived factors on intent to use and perceived usefulness and secondly to appreciate how with increasing user experience with the technology system over a period, the impacts of these determinants alter.

5. Theory of Planned Behaviour (TPB) is proposed as a logical next-step of the Theory of Reasoned Action (which was related to voluntary behaviour). This was to a large extent due to TRA not comprehensively addressing those behavioural aspects which are not under the complete voluntary control of an individual. To overcome this shortcoming, TPB added another construct of intention, “Perceived Behaviour Control (PBC)”.

6. Decomposed Theory of Planned Behaviour (DTPB). This model more completely explores the dimensions of attitude belief, subjective norm (i.e., social influence) and perceived behavioural control by decomposing them into specific belief dimensions. The DTPB suggests that behavioural intention is the key factor which influences ones actions, however, the original three core constructs still exist: “Attitude Toward Behavior (ATB), Subjective Norm (SN)”, and PBC as first introduced in TPB.

7. Combined TAM and TPB (C-TAM-TPB). TAM hasn’t paid any heed to control and social determinants affecting ones behavioural intention, however, these constructs do exercise due effect on innovation/technology adoption. It may be noted that these constructs are vital influencers of behaviour in the TPB. The study by Taylor and Todd in 1995 therefore added two factors: SN & PBC to TAM to provide a more complete test of the important determinants of Technology adoption, due to the fact that they could anticipate the adoption of technology and also because of their large scale acceptance in social psychology.

8. The Unified Theory of Acceptance and Use of Technology (UTAUT). It consists of four key factors of usage and intention as well as four other supplementary factors affecting the outcome. The UTAUT was postulated by propounding that these four key
factors significantly influence as to adoption of a technology and its subsequent exploitation. The factors are - performance expectancy, effort expectancy, social influence and facilitating conditions.

**Innovations Diffusion Theory (IDT)**

Innovations Diffusion Theory (IDT) has been used since the 1950s to describe the innovation-decision process. It has gradually evolved until the best well-known innovation-decision process was introduced by E.M. Rogers. The innovation-decision process is one through which an individual (or other decision-making unit) goes through the following stages or functions of the model:

1. From first knowledge of an innovation - knowledge occurs when an individual is exposed to an innovation’s existence and gains some understanding of how it functions.

2. To forming an attitude toward the innovation - persuasion occurs when an individual forms a favourable or unfavourable attitude toward the innovation.

3. To a decision to adopt or reject - decision occurs when an individual becomes involved in activities that lead to a decision to adopt or reject the innovation.

4. To implementation of the new idea - implementation occurs when an individual puts an innovation into use.

5. To confirmation of this decision - confirmation occurs when an individual seeks reinforcement for an innovation-decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation.
In the persuasion stage, five attributes that persuade an individual to adopt the innovation are:

1) relative advantage
2) compatibility
3) complexity
4) trialability
5) observability

Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes, the degree of relative advantage is often expressed in economic profitability but the relative advantage dimension may be measured in other ways (e.g. social). Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receivers. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. The complexity of an innovation is negatively related to its rate of adoption. Trialability is the extent to which a new concept may be tried to some extent. Observability is the extent to which the outcomes of a new concept are apparent to others (Rogers, E.M., 1995).

Theory of Reasoned Action (TRA)

Ajzen and Fishbein developed a versatile behavioural theory and model in 1980 called the Theory of Reasoned Action (TRA). This model forms the backbone of studies associate with attitude-behaviour relationships. The TRA postulates that one’s thinking affects one’s attitude and
subjective norms. These factors then impact one’s behavioural intention, which in turn has a significant influence on one’s behaviour. Intention implies a sustained resolution towards a particular act, and as per this model is the predecessor of behaviour.

TRA has two key conceptual factors (main determinants) of intention which are connected with that behaviour:

(1) Attitude toward behaviour (ATB).

(2) Subjective norm (SN) (Figure 7.2).

The attitude toward the behaviour (ATB) is the previous attitude of a person toward performing that behaviour. It suggests that before making up one’s mind towards a particular course of action, people think about their decisions and the possible outcomes of their deeds. This theory postulates that a sustained resolution towards a particular act, ie. Intention, would lead one to take a particular course of action. Also, that one’s thinking affects one’s attitude and subjective norms. So if a person is optimistic about positive outcomes resulting from that course of action, will most likely take that course of action. Inversely, if an individual is pessimistic about positive outcomes resulting from that course of action, he will most likely not take that course of action.

Subjective norm (SN) is the influence of social and other extraneous factors on an individual’s decision-making process. SN is how a person feels or thinks as to how others will judge his resorting to a particular course of action. This is especially instrumental in affecting that individual’s decision if he holds these persons in high regard. Thus, we find that a majority of us take important decisions after due deliberation and consultation with those whose opinion we value.
Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed from TRA by Davis. This model used TRA as a theoretical basis for specifying the causallinkages between two key beliefs: perceived usefulness (PU) and perceived ease of use (PEOU) and users’ attitudes, intentions and actual technology usage behaviour. Perceived usefulness is a person’s evaluation of a particular innovation benefitting him, while perceived ease of use is his appreciation of adopting that particular innovation without any complications. Behavioural intention is, as per this model, the predecessor of system usage. It is influenced directly by perceived usefulness and one’s attitude towards adopting that technology or innovation. In turn, perceived ease of use and perceived usefulness influence one's attitude (Figure 7.3). So, one can say, that TAM deals with non-specific factors of whether or not a technology would be adopted has thus been used to this purpose across a wide gamut of innovations and technologies as well as class/type of users.

The goal of TAM is to provide an explanation of the determinants of computer acceptance that is in general capable of explaining user behaviour across a broad range of end-user computing
technologies and user populations, while at the same time being both parsimonious and theoretically justified.

TAM theorised that the effects of external variables (e.g., system characteristics, development process, training) on intention to use are mediated by perceived usefulness and perceived ease of use. Perceived usefulness is also influenced by perceived ease of use because if other things are equal, the easier the system (technology) is, the more useful it can be (Davis F.D., 1989).

**Technology Acceptance Model 2 (TAM2)**

TAM2 was developed by Venkatesh and Davis, and it was first introduced in 2000. The goal of TAM2 is a logical next-step of the Technology Acceptance Model (TAM) to (1) include additional key determinants of TAM that explain the impact of social and other derived factors on intent to use and perceived usefulness (2) to understand how the effects of these determinants change with increasing user experience over time with the target system. A better understanding of the determinants of perceived usefulness would enable us to design organizational interventions that would increase user acceptance and usage of new systems (technologies) (Figure 7.4).
The Theory of Planned Behaviour (TPB) is proposed as a logical next-step of the Theory of Reasoned Action (which was related to voluntary behaviour). This was to a large extent due to TRA not comprehensively addressing those behavioural aspects which are not under the complete voluntary control of an individual. To overcome this shortcoming, TPB added a third independent construct of intention, perceived behaviour control (PBC).

For this reason, TPB was introduced by Ajzen in 1985. The theory was called the theory of planned behaviour (TPB) since it evolved from the Theory of Reasoned Action, with one more construct (PCB). According to Ajzen, TPB incorporates an additional construct in order to account for circumstances in which a person cannot take the steps to achieve a desired objective due to paucity of requisite powers or wherewithal. TPB is a theory that predicts deliberate behaviour,
because behaviour can be deliberative and planned, and TPB is not as specific as TRA because of PCB.

Similar to TRA, the best predictor of behaviour in TPB is intention. As for TPB, the intention is decided by three core constructs: (1) attitude toward the specific behaviour, (2) subjective norms (SN) and (3) perceived behavioural control (PCB) (Ajzen 1991). Perceived behavioural control influences intentions (perceived behavioural control refers to people's perceptions of their ability to perform a given behaviour). Once again, as a norm, if the attitude is positive, and subjective norms agreeable, with an enhanced degree of perceived behaviour control, the greater should be a person’s resolve to undertake a particular course of action (Figure 7.5).

It can be noticed that when individuals are given the reins of control of their actions in their own hands, they will normally undertake the desired course of action. Examples of items that can be researched with the theory of planned behavior are whether to wear a seat belt, and whether to check oneself for disease (Ajzen, I, 1985).

In addition, according to the TPB, one's actions are influenced by three types of beliefs:

1) Behavioural beliefs - beliefs about the possible results of one's actions and the analysis of these results. These beliefs can have a positive or negative impact on the adoption of a particular course of action.

2) Normative beliefs deal with what one feels as to how people who matter, like the individuals immediate relatives, close friends and colleagues, mentors and those on whom he is dependent professionally would want him to act. These beliefs exert social influence, in other words, represent subjective norm.

3) Control beliefs - beliefs about their being significantly strong determinants existing that would help pave the way for a particular course of action. These beliefs give rise to feeling of being in control of one's destiny, and thus, in turn engender perceived behavioural control.
By manipulating these three predictors (attitude, subject norm and perceived behavior control), the probability of an individual undertaking a particular course of action can be enhanced, leading to the actual occurrence of that event (Ajzen, I, 2002).

Decomposed Theory of Planned Behaviour (DTPB)
The Decomposed TPB (DTPB) was introduced by Taylor and Todd in June 1995. This model more completely explores the dimensions of attitude belief, subjective norm (i.e., social influence) and perceived behavioural control by decomposing them into specific belief dimensions. The DTPB suggests that behavioural intention is the key factor which influences one’s actions, however, the original three core constructs still exist: attitude toward behavior (ATB), subjective norm (SN), and perceived behavior control (PBC) as first introduced in TPB (Figure 7.6).

Todd suggests decomposing attitudinal belief into three constructs: perceived ease of use (PEOU), perceived usefulness (PU) and compatibility. These three constructs have regularly been associated with influencing the adoption of technology.

Normative belief was decomposed into peer influence and superior’s influence, because each may have different views on IT usage. For example, peers of the user may be opposed to the use of a particular system, because they think it requires too much change in their work processes. But superiors of the user may be encouraging the use of the system because they anticipate certain productivity payoffs. In such a situation, a monolithic normative structure may show no influence on subjective norm or intention because the effects of the referent groups may cancel each other.

![Diagram of Decomposed Theory of Planned Behavior](attachment://Figure_7.6.png)
out. So it has been suggested to decompose normative belief into two referent groups (peers and superiors) because the expectations of peers, and superiors may be expected to differ.

Perceived behaviour control (PBC) was decomposed into three constructs: self-efficacy, and technology and resource facilitating conditions. Self-efficacy is related to perceived ability, and it is expected that a greater degree of self-efficacy will lead to a greater degree of behavioural intention. The facilitating conditions construct provides two dimensions for control beliefs: one relating to resource factors (resource facilitating conditions) such as time and money and the other relating to technology compatibility issues (technology facilitating conditions) that may constrain usage. The absence of facilitating resources represents barriers to usage and may inhibit the formation of intention and usage. However, the presence of facilitating resources may not encourage usage. This model seemed to have more capability in explaining usage behaviour although is a less parsimonious model when compared to TPB (Taylor, S., et al., 1995(1)).

**Combined TAM and TPB (C-TAMTPB)**

TAM hasn’t paid any heed to control and social determinants affecting ones behavioural intention, however, these constructs do exercise due effect on innovation/technology adoption. It may be noted that these constructs are vital influencers of behaviour in the Theory of Planned Behaviour.

The study by Taylor and Todd in 1995 therefore added two factors: subjective norm and perceived behavioural control to TAM to provide a more complete test of the important determinants of Technology adoption, due to the fact that they could anticipate the adoption of technology and also because of their large scale acceptance in social psychology. This model is referred to as “Augmented TAM” or “Combined TAM and TPB” (C-TAM-TPB) (Figure 7.7).
Taylor and Todd suggest that augmented TAM provides a comprehensive model of IT usage, both, for those who are conversant with the technology and for those who are yet to be exposed to it. For both groups, all direct determinants of intention, except attitude, were significant. Therefore, the augmented TAM can be used to predict subsequent usage behaviour prior to users having any experience with a system (technology). This suggests that this model can be used to predict usage for people who have never used the technology before as well as the capacity to predict usage for people who have used the technology or for people who are familiar with the technology. So IT usage models may be employed diagnostically prior to implementation or after implementation both with inexperienced and experienced users (Taylor, S., et al., 1995(2)).

**Unified Theory of Acceptance and Use of Technology (UTAUT)**

Venkatesh, Morris, Davis, G.B. and Davis F.D. introduced the Unified Theory of Acceptance and Use of Technology (UTAUT) consisting of four key factors of usage and intention as well as four other supplementary factors affecting the outcome. The UTAUT was postulated by propounding...
that these four key factors significantly influence as to adoption of a technology and its subsequent exploitation. The factors are:

1) performance expectance
2) effort expectancy
3) social influence
4) facilitating conditions

Attitude toward using technology, self-efficacy, and anxiety are theorised not to be direct determinants of intention. The key moderators in the model are gender, age, voluntariness, and experience (Figure 7.8).

![Figure 7.8 Unified Theory of Acceptance and Use of Technology](https://example.com/figure7.8)

In theory, UTAUT provides a refined view of how the determinants of intention and behaviour evolve over time, it is important to emphasise that most of the key relationships in the model are moderated. For example, age has received very little attention in the technology acceptance research literature, but the findings from the study of UTAUT indicate that it moderates all of the key relationships in the model. In addition, gender which has received some
recent attention is also a key moderating influence, which is consistent with the findings in the sociology and social psychology literature.

(Venkatesh, V., et al., 2003)

**Model for this Study – Enhanced TAM**

Based on the study of the above models/theories, it was decided to evolve a model that would suit the following requirements:

1. Introduction of a Next Generation technology.
2. The psyche peculiar to the Indian mindset.

TAM hasn’t paid any heed to control and social determinants affecting ones behavioural intention, however, these constructs do exercise due effect on innovation/technology adoption. This research resorts to a technique of adopting an enhanced TAM by including two pertinent factors adopted from UTAUT and TPB. This was resorted to as the *ibid* models have points to be recommended as well as some shortcomings. These constructs are

1. Facilitating Factors and
2. Social Factors.

So as to be able to gauge with a greater degree of certainty the likelihood of BWA being accepted in India, this research adds two other variables keeping the typical Indian attitude in mind, namely:

1. Cost Factors and
2. Quality Factors.

This new, modified, enhanced TAM is shown in Figure 7.9.
Figure 7.9 Enhanced TAM