

## TECHNOLOGY ACCEPTANCE: AN INDIVIDUAL PERSPECTIVE CURRENT AND FUTURE RESEARCH IN MALAYSIA

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***“Technology and technological systems are integral to everything we do and can do”***

(Pearson & Young, 2002)

### ABSTRACT

*This paper delves into the state of the art in technology acceptance research at the individual level in Malaysia and makes suggestion into the future researches that can be undertaken to extend the frontiers of research of technology acceptance at the individual level. Several popular models used to predict technology acceptance are also discussed before exploring the myriad of research done on individual technology acceptance in the Malaysian context. The paper puts forward the notion that the current research although extensive, lacks the completeness in understanding the technology acceptance decision as there are many other areas that has been less researched or left out altogether. The paper further discusses some future areas of research where researchers looking at the individual level technology acceptance can take on to expand the literature in this domain.*

### 1. INTRODUCTION

The excerpt below from the Human Resources Minister Datuk Fong Chan Onn who lamented that “among the problems faced by many Malay graduates and those from other races were their weak command of English, lack of confidence and lack of knowledge in information technology”. (The Star, 2004) The comment relating to the lack of knowledge in information technology struck us as something which should be uncommon in a world of knowledge economy that the government is set to pursue.

This notion of the knowledge economy has prompted Malaysia to reposition and reinvent itself through a series of radical policy changes to prepare its knowledge citizens for future challenges. The K-Master Plan coupled with Multimedia Super Corridor (MSC) are examples of Malaysia’s agenda in the paradigm shift from production economy to K-based economy, which stresses on capitalizing human (knowledge) capital to create, innovate and commercialize knowledge through the use of information and communication technologies. Seven strategic thrusts, ranging from ensuring the necessary infra/info structure and bridging the digital divide were outlined to restore the nation’s competitiveness. In spite of current info/infrastructure and policies that are provided by the government, the level of human capability to fully utilize the resources is not at par with the existing structures.

Therefore, computer literacy has achieved much attention in the K-Master Plan in developing knowledge workers. The “one-computer-to-one-family” policy, where amendments to the Employee Provident Fund (EPF) Act allowed for the withdrawal of monies for the purchase of personal computers, was one of the initiatives in this direction. Although it was terminated due to fraudulent practices of the fund contributors, the government launched another scheme called PC Gemilang to overcome the earlier problem. Secondly, Malaysia seeks to convert all its primary and secondary schools to smart schools (which are schools with IT enhanced infrastructure) by the year 2010 through one of the flagships championed by the MSC. Despite these favorable policies and infrastructures, they do not guarantee that there will be a high rate of technology acceptance at the individual level.

It is difficult to overestimate the impact of technology on society and on individuals (Edison & Geissler, 2003). Technology drives growth and economic progress, and the pace of innovation is quickening (Hunt, 1999), affecting everyone as it changes the fabric of the society (Edison & Geissler, 2003). Empirical studies have shown that computer technology may have effects on the nature of officework, job satisfaction, and the quality of work life (Turner, 1984). Agarwal and Prasad (1999) argued that systems that are not utilized do not result in expected efficiency and effectiveness gains.

While technology is pervasive in the modern society, not all individuals view the technology as beneficial. Some individuals are uncomfortable with technological change, do not enjoy the uncertainty and are reticent to embrace these tools and ideas whereas others welcome them and enjoy the challenge (Edison & Geissler, 2003). Each individual faces the decisions involving the development and use of technology, be it consumers, workers, family members or even the citizens at large.

Persuading users to adopt new information technologies persists as an important problem confronting those responsible for implementing new information systems (Agarwal & Prasad, 1999). Thus the question "What causes individuals to adopt new information technologies" (Agarwal & Prasad, 1999; Igbaria, Iivari & Maragahh, 1995).

## **2. MODELS OF TECHNOLOGY ACCEPTANCE**

Several models have been developed to investigate and understand the factors affecting the acceptance of computer technology in organizations. Among the notable models include Technology Acceptance Model (TAM) (Davis, 1989), Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975, Ajzen & Fishbein, 1980) and Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991). We will briefly describe these models that have been advanced in the technology acceptance domain research.

### **2.1 Theory of Reasoned Action (TRA)**

The intention to accept or reject a particular technology is based on a series of tradeoffs between the perceived benefits of the system to the user and the complexity of learning or using the system. This phenomenon can be reasonably explained by using the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). TRA essentially argues that social behavior is motivated by an individual's attitude towards executing that behavior. Therefore, the change of behavior is a function of one's beliefs about the outcomes of the behavior and an evaluation of the value of each of those outcomes (Ji-Won Moon & Young-Gul Kim, 2001). In short, TRA proposes that individual beliefs influence attitudes, hence, creating intentions that will generate behavior.

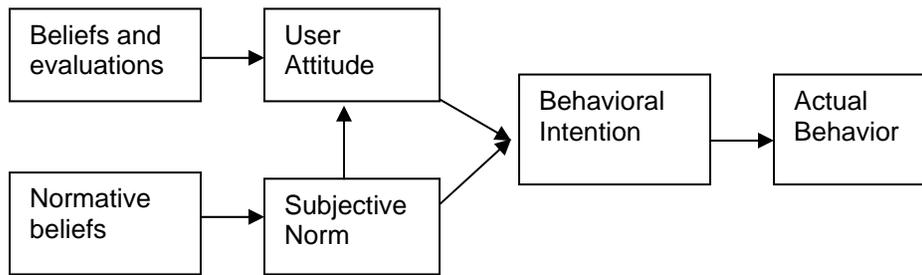
The TRA proposes that behavior results from the formation of specific intentions to behave (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). According to the TRA model, two major factors determine behavioral intentions namely: the person's attitude toward the behavior, and subjective norms.

Attitude toward the behavior refers to the person's judgment that performing the behavior is good or bad. The subjective norms reflect the person's perception of social pressures put on him/her to perform or not to perform the behavior in question. According to the theory, attitudes are a function of beliefs. In general, a person who believes that performing a given behavior will lead to positive outcomes will hold a favorable attitude toward performing the behavior. Similarly, a person who believes that performing a given behavior will lead to negative outcomes will hold an unfavorable attitude toward performing the behavior. Thus, attitude toward the behavior is a function of both the beliefs that the behavior leads to certain outcomes, and by the person's evaluation of these outcomes.

Additionally, subjective norms are a function of normative beliefs. In other words, a person who believes that most referents with whom he/she is motivated to comply think he/she should perform the behavior will perceive social pressure to do so. Conversely, a person who believes that most referents with whom he/she is motivated to comply think he/she should not perform the behavior will perceive social pressure to avoid performing the behavior. Thus, the general subjective norm is determined by the perceived expectation of specific referent individuals or groups, and by the person's motivation to comply with those expectations.

The TRA (Ajzen & Fishbein, 1980) has been widely used to explain and predict many health-related behaviors including breast-feeding (Manstead, Proffitt & Smart, 1983, Kloeber & Thompson, 1999). According to the TRA model (Fishbein and Ajzen, 1975; Ajzen & Fishbein, 1980), intention is the immediate determinant of behavior. A person's intention is assumed to reflect his attitude toward the behavior and his subjective norm.

The TRA model (Fishbein and Ajzen, 1975; Ajzen & Fishbein, 1980) is as shown in Figure 1.

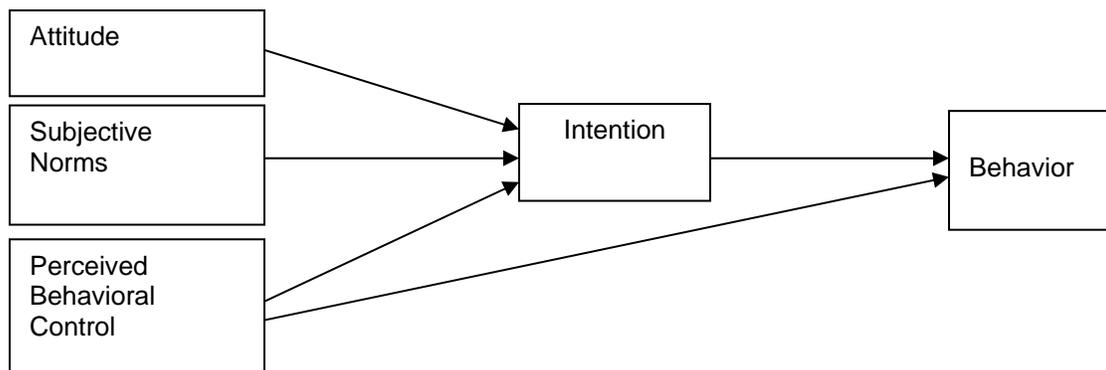


**FIGURE 1. THEORY OF REASONED ACTION**

## 2.2 Theory of Planned Behavior(TPB)

An expansion of the TRA is the Theory of Planned Behaviour (TPB) (Ajzen, 1985). TPB includes the construct, perceived behavioral control to measure and account for the extent to which users have complete control over their behavior, i.e. the extent to which the behavior is truly at the discretion of the user. In TPB, behavioral control directly affects the intention to perform a behavior, and may directly affect behavior in situations where the user intends to perform the behavior, but is prevented from doing so (Ajzen, 1985). Perceived behavioral control relates to the extent to which the person believes that s/he has control over personal or external factors that may facilitate or constrain the behavioral performance (Ajzen, 1991). It is assumed to have direct effect on both behavioral intention and behavior.

TPB is also widely used in predicting behavioral intention. For example, in consumer behavior studies, Shim et al. (2001) developed a model to predict consumers' intention to purchase via the Internet. The findings of Shim et al. (2001) revealed that all three variables, attitude, subjective norms and perceived behavioral control significantly influence the intention to use the internet for information search.



**FIGURE 2. THEORY OF PLANNED BEHAVIOR**

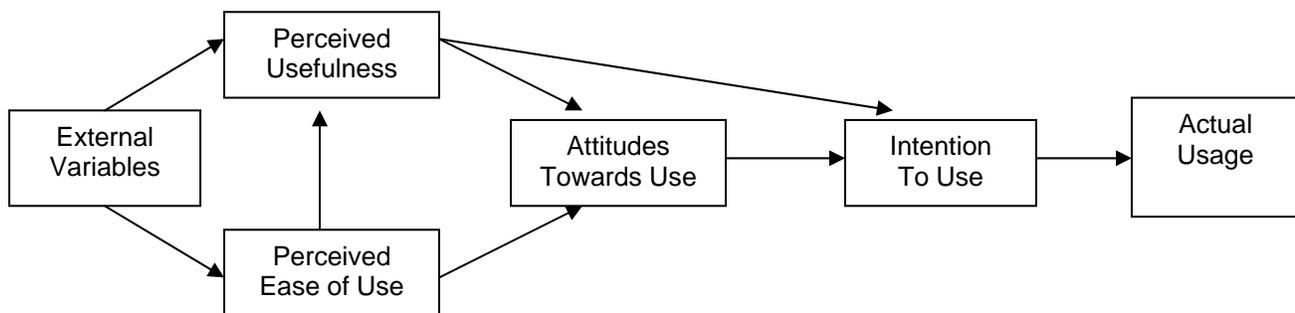
## 2.3 Technology Acceptance Model

The Technology Acceptance Model (TAM) pioneered by Davis (1989) advances the TRA by postulating that perceived usefulness (PU) and perceived ease of use (PEU) are key determinants that inevitably lead to the actual usage of a particular technology or system. Perceived usefulness is defined as “the degree to which an individual believes that using a particular system would enhance his or her productivity” while perceived ease of use is defined as “the degree an individual believes that using a particular system would be free of effort” (Davis, 1989). Between the two, perceived ease of use has a

direct effect on both perceived usefulness and technology usage (Adams, Nelson & Todd, 1992; Davis, 1989).

Dishaw and Strong (1999) have summarized that TAM represents the tailoring of a well-developed social psychology theory, the TRA, to the specific behavior of using IT. TAM theorizes that an individual's behavioral intention to adopt a technological system or innovation is determined by two beliefs, perceived usefulness and perceived ease of use.

Davis (1989) has also found that there is a relationship between users' beliefs about a technology's usefulness and the attitude and the intention to use the technology. However, perceived usefulness exhibited a stronger and more consistent relationship with usage than did other variables reported in the literature. In addition, an individual may adopt a technology if he or she perceives it as convenient, useful and socially important even though they do not enjoy using the technology (Saga & Zmud, 1994). Thus, there might be a possibility of a direct relationship between beliefs and intentions. Furthermore, it is suggested that there are external variables that affect both perceived ease of use and perceived usefulness (Davis et al., 1989).



**FIGURE 3. TECHNOLOGY ACCEPTANCE MODEL (TAM)**

Although TAM was influential in predicting and explaining technology acceptance in general, it lacks the specificity of users' opinions on specific system or technology. Due to this reason, researchers (e.g. Davis and Venkatesh, 1996; Venkatesh and Davis, 2000) pursued vigorous validation and extension of the TAM under different environments to increase its explanatory power. Additionally, a number of modified TAM models (e.g. Chau, 1996; Igarria, Zinatelli, Cragg and Cavaye, 1997; Agarwal and Prasad, 1998; Hu, Chau, Sheng and Tam, 1999; Jiang, Shu, Klein and Lin, 2000; Chau and Hu, 2001; Horton, Buck, Waterson and Clegg, 2001) were developed to address acceptance of new technologies and their industrial application.

## 2.4 Selecting a model

For IT usage, behavioral control has had limited importance (Dishaw & Strong, 1999). A comparison of TAM and TPB has largely concluded that TAM's ability to account for variance in intention to use or actual use is about the same as TPB's (Mathieson, 1991; Taylor & Todd, 1995). TRA on the other hand is more widely used in consumer behavior research, whereas TAM is a specific adoption of the theory of reasoned action (TRA) model (Ajzen & Fishbein, 1980) to the study of IT usage. **It is one of the most influential models widely used in the studies of the determinant of IS/IT acceptance.** Many previous studies have adopted and expanded this model, which was empirically proven to have high validity (Chau, 1996; Davis, 1989; Mathieson, 1991; Adams et al., 1992; Segars & Grover, 1993; Igarria et al., 1995, 1997). **TAM is also acclaimed for its parsimony and predictive power (Mathieson, 1991) which makes it easy to apply to different situations.** Thus, it is argued that TAM will also be useful in the predicting and explaining technology usage in Malaysia.

### **3. RESEARCH DONE IN MALAYSIA**

Similarly in Malaysia, the advancement of the TAM is kept abreast with the latest development and diffusion of technologies in respective industries. The discussion will be divided into 5 areas of research, applications of TAM, usefulness of TAM in educational sector, SME's, general public and the manufacturing environment.

Ndubisi et al. (2001) tested the applicability of TAM for predicting entrepreneurs' technology usage and found it to be valid. Ma'ruf et al. (2002, 2003) further validated the usefulness of TAM in predicting Internet shopping whereas Ramayah et al. (2002a) tested the applicability of TAM for Internet banking users and non-users.

In the education sector Ramayah et al. (2003c) tested the TAM incorporating motivational variables to explain Internet usage among students of institutions of higher learning. Ramayah and Aafaqi (2004), Ramayah et al. (2004a) expanded the use of TAM in predicting e-library usage with the aid of self-efficacy. Whereas Ramayah et al. (2004b) used the TAM model to explain PC (Personal Computer) use among students of a private institution of higher learning.

Ma'ruf et al. (2002, 2003), Ramayah and Jantan (2003b) used the TAM to explain Internet shopping among the Malaysian public. Ramayah et al. (2003d, 2003h) on the other hand used the TAM model to explain the Internet usage phenomenon among the Malaysian public. Ramayah et al. (2003e) replicated the TAM to understand the receptiveness of Malaysian consumers in the E-banking sector.

In the SME sector, Jantan et al. (2001) conducted a study to understand multiple factors that influence PC acceptance among small and medium sized companies. In addition, Ramayah, Siron, Dahlan and Mohamad (2002b) used the TAM to study technology usage amongst owners/managers of SME's. Ramayah et al. (2003g) used the TAM to assess the acceptance of web-based supply chain management among SMEs. Recently, the study was extended to include the moderating effect of self-efficacy on the acceptance of web-based supply chain management among SMEs (see Ramayah and Jantan, 2003a).

In the manufacturing environment, TAM was used by Ramayah and Lo (2004) to explain the use of Enterprise Resource Planning (ERP) system among the managers of manufacturing firms in the northern region of Malaysia.

#### **3.1 Value added research**

Rather than accepting the TAM model as it is, Ramayah et al. (2002a) argued that the TAM model will yield different results for users and non-users of Internet banking and have shown that there is a possibility of understating the relationship when the 2 groups are used as a whole. This finding is interesting in the Malaysian environment where the technological maturity is still something difficult to achieve.

Aafaqi et al. (2003) further looked at the temporal effect on the relationship posited by the original TAM model to gauge the stability of TAM over time. They found that the TAM relationship remains stable even with the passage of time thus indicating that TAM can also be used in longitudinal research.

#### **3.2 Summary of research done in Malaysia**

All the research cited above supported the TAM model in predicting and explaining use of or the intention to use a particular technology in the 5 broad areas described above. There is a general consensus that perceived usefulness is significantly related to technology use. A person who finds a particular technology useful will use more of the technology as compared to another person who finds it not useful. On the other hand, most research finds perceived ease of use is useful in predicting perceived usefulness; quite often it is not significantly related to usage or intention to use. Researchers have explored various external variables that can act as antecedents (e.g. prior experience, education, etc.) to these two constructs (perceived usefulness and perceived ease of use) in attempts to improve the predictive power

of the expanded TAM; some were found to be significant and some were not. Thus it can be concluded that particularly in the Malaysian environment perceived usefulness is the driver to any technology acceptance and this has to be tackled to enhance usage among individuals.

#### **4. FUTURE RESEARCH**

Although much research has been conducted at validating TAM in the Malaysian environment with mixed results, there remains other areas of research that can be explored when looking at individual technology acceptance.

In a recent publication of the Journal of Targeting, Measurement and Analysis for Marketing, Edison and Geissler (2003) suggest that there is a need for further development of scales to measure attitude towards general technology. This points to the fact that the current instruments that are available might not be able to fully capture the variables/constructs that are of interest to the researchers. In other words the instrument is susceptible to measurement errors arising from the language used, the items used and length of the instrument. As most of the researches done thus far have either adopted or adapted existing instruments there have not been many attempts at developing new instruments except for Ramayah et al. (2004c, 2004d) who endeavored to develop an instrument to measure e-readiness of SME's. This exercise showed that nearly 11 items had to be dropped from the 21 questions originally identified from a focus group study indicating the extent of problem in measuring latent constructs.

Another area that has been neglected is that of looking at the psychographics of users and non-users of technology in trying to explain how the decision is influenced by the psychographics. This is being undertaken by a DBA student under the supervision of the author. This endeavor is at the data collection stage and it will be interesting to see what comes out of the data analysis.

The author is also looking into the effect of language on the instrument used. Translation of existing instruments into the national language, Bahasa Malaysia and then test it on 2 equivalent samples to see if there exist any differences in the way the respondents answer the questions forwarded. Although this was done in Ma'ruf, Ramayah and Mohamad (2002) research on Internet shopping where there were three versions of the instrument, Bahasa Malaysia, Bahasa Indonesia and English administered in Indonesia, Malaysia and Singapore yielded no significant differences in the responses. Indicating that language had no effect. One plausible reason could be that this is a biased sample as only those who are web users were included and these respondents were well versed with the terminology, jargon and language of the Internet. Further research into this area is a possible avenue for thought.

Another area where the research can look into is the addition of external variables, which may be pertinent to the Malaysian environment and culture thus increasing the ability and predictive power of the TAM model.

A model comparison approach can also be undertaken to compare the predictive power of TRA, TPB, TAM and other competing models to better understand the applicability of these models in a multi cultural environment such as Malaysia.

What would be interesting at this stage would be to understand the processes that individuals go through when making the decision. The literature is lacking in this aspect. The sense-making model of technology adoption is relatively less explored. What TAM has done is looking at the adoption process as a whole. Understanding the processes will indicate the various factors that may be pertinent at the various stages and therefore may even have conflicting effects on the final decisions. Further, the knowledge gained from such a research will help identify areas to change the perceptions.

## 5. CONCLUSION

Individual technology acceptance has to be researched extensively in lieu of the fact that the move towards knowledge economy which inadvertently is related to technology and technology usage. More researches should be conducted to help understand the phenomenon of technology acceptance at the individual level to help managers and policy makers in the ways to make the transition a smoother one. As has been said earlier persuading users to adopt new information technologies persists as an important problem confronting those responsible for implementing new information systems (Agarwal & Prasad, 1999).

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