TECHNOLOGY ACCEPTANCE MODEL (TAM): EMPOWERING SMART CUSTOMER TO PARTICIPATE IN ELECTRICITY SUPPLY SYSTEM

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ABSTRACT

Based on the literature on the technology acceptance model (TAM) and related efforts in technology adoption research, this paper proposed an extended model for analyzing supply system acceptance of users. Innovation adoption has been widely researched in academe, industry and the public sector. The user readiness to adopt and use smart grid will be evaluates using Technology Acceptance Model. This Literature review is based on articles relating to TAM model being identified and observed to have been published in journals from databases EBSCOhost , Emerald, Proquest New Platform, Science Direct and IEEE Explore between the year 1998-2013. The most recent studies investigate the TAM model in information system and involved service industries in its scope have been reviewed. A discussion on the TAM model and factor on consumer acceptance smart grid is presented and conceptual framework and model are proposed.

Keywords: Technology Acceptance Model (TAM), Perceived ease of use, Perceived usefulness, Attitude towards Usage, smart grid

INTRODUCTION

Advances in computing and information technology are altering the way people meet and exchange a few words. Community can meet, talk, and work collectively external traditional meeting and office spaces. For instance, with the introduction of software designed to help people schedule meetings and facilitate decision or learning processes, is weakening geographical constraints and changing interpersonal communication dynamics. Information technology is also dramatically affecting the way people teach and learn.

In studying user acceptance and use of technology, the TAM is one of the most cited models. The Technology Acceptance Model (TAM) was developed by Davis to explain computer-usage behavior. The theoretical

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basis of the model was Fishbein and Ajzen's Theory of Reasoned Action (TRA). The Technology Acceptance Model (TAM) is an information systems (System consisting of the network of all communication channels used within an organization) theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new software package, a number of factors influence their decision about how and when they will use it.

The statement of problem for this research is expand from Technology acceptance model theory where the technology acceptance among users and customers triggered from two general viewpoints on the decision to accept or reject a certain technology. These two viewpoints could affect the decision of users to adopt the innovation of technology.

Technology Acceptance Model (TAM)

TAM is to provide a basis for tracing the impact of external variables on internal beliefs, attitudes and intentions. It suggests that perceived ease of use and perceived usefulness are the two most important factors in explaining system use. The model does leave open the potential to incorporate perceived value impacts as antecedents of its constructs or as additional external factors. TAM model a derivative of the Theory of Reasoned Action that attempts to explain the psychological determinants of attitudes and subsequent acceptance behavior towards Information Technology (IT) in the workplace and TAM is suitable for examining perceptions, attitudes, and intentions before implementation as well as after [Vankatesh and Davis, 2000, p.286]. Additionally, TAM is consistently explains a substantial proportions of the variance about 40% in usage intentions and behavior compare to Theory of Reasoned Action and Theory of Planned Behavior (TPB) [Vankatesh and Davis, 2000, p.286]

From the Davis study it shown that perceived usefulness proposed six items measurement tools and the most commonly use are 1) using(application) increase my productivity 2) using (application) increase my job performance 3) using (application) enhance my effectiveness on the job 4) overall, I find the (application) useful in my job. All measure of PU is found to lead to an acceptable level of internal consistency. From the study, the four items frequently used for measuring PEOU are 1) learning to operate (the application is easy for me 2) I find it easy to get the application to do what I want to do 3) the

(application) is rigid and inflexible to interact with 4) overall I find the (application) easy to use. TAM has proven to be useful theoretical model in helping to understand and explain use behavior in IS implementation and also this model show that use will accept the technology is useful for them by give specific benefit to enhance their performance. Tam has demonstrated that it is valid, robust and powerful model for predicting user acceptance(Blanca, Julio & M Jose, 2008) .TAM has become so popular that it has been cited in most of the research. However some researchers claim that TAM may have attracted more easy and quick research, such that less attention has been given to the real problem of technology acceptance (Lee, Kozar, & Larsen, 2003).

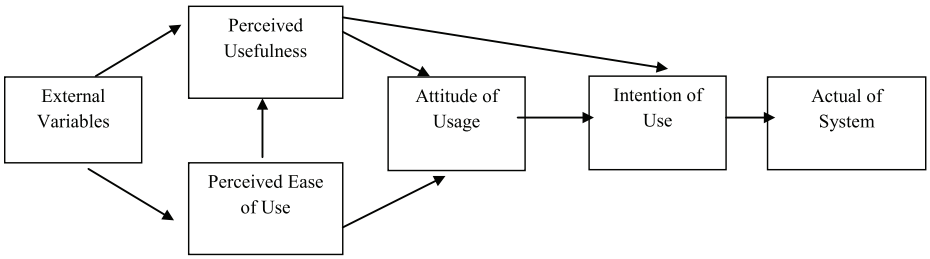

Figure 1: Technology Acceptance Model sources by Davis et. al 1989

Perceived ease of use

TAM model where defined this variable as "refers to the degree to which the prospective user expects the system to be free of effort" (Davis, 1989, p.319) respective to mental and physical efforts as well as ease of learning. Perceived ease of use affects perceived usefulness and both variables are significant predictors of attitude toward use. The more positive the perceived ease of use and perceived usefulness of the system the higher probability of actually using the system.

Perceived ease of use has small significant effect on behavioral which after that will subside over time. The influence of perceived ease use is less deep towards behavior compare to perceived usefulness. (King & Jun, 2006). On the previous researcher where the researcher is study about social Networking sites (SNS) adoption state that perceived ease of use has significant effect on perceived usefulness where user feel that a particular SNS is easy to use. (Goh, Suddin & Zulkifli, 2011). On the other side, from study in e-government learning by using web-based technology, perceived usefulness most impacted behavioral intention rather than perceived ease of use.(Stacy &Hung.J, 2011). In the context of M-Banking, perceived ease of use has give influence towards adoption

of this technology and predicts usage intention to use the system. (Lules, Kerage T. & Mwolo.T, 2012).

Perceived ease of use is concept where an individual usage target system to be relatively free to effort and the performance similar character with complexity by Roger's theory. The adoption and use of business management software by employee's lack of connection between their level of use and their perception which is perceived ease of use (Blanca, Jimenez J.& Jose M., 2008). Perceived ease use in this model also respective to mental and physical efforts as well as ease of learning (Yang H. & Yo Y., 2004).Perceived ease of use is concept where an individual usage target system to be relatively free to effort and the performance similar character with complexity by Roger's theory. The adoption and use of business management software by employee's lack of connection between their level of use and their perception which is perceived ease of use. (Blanca, Julio & M Jose, 2008). Perceived ease use in this model also respective to mental and physical efforts as well as ease of learning (Yang, 2004). The other previous study in the context electronic supermarket TAM is explained up to 15% of the variance in the behavioral indicators through perceive ease of use and usefulness of the system but based on the result finding, the perceived ease of use of the system did not uniquely contribute to the prediction of behavior when usefulness was considered, indicting a mediation effect. (Henderson & Divett, 2003)

Perceived usefulness

According to Davids , "user's subjective probability that using a specific application system will increase his or her job performance within an organizational context." (p.285) and it is similar characteristic with Roger's theory 'relative advantage'. Usefulness has direct effect on behavioral intentions over and above its effect on attitude (Agarwal R. & Prasad J., 1997 p.557) and usefulness is far more important than ease of use in predicting usage (Vankatesh & Davis, 2000, p.286). Perceived usefulness is responsible for the greatest influence on people's intention. (Chuttur, 2010) and lead to an acceptable level of internal consistency (Legris P, Ingham J. & Collerette, 2002). In addition, an individual may adopt a technology if he or she perceives it as convenient, useful and socially desirable 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.

From previous research, [Deng, William J., Anthony R., Hendrickson & Joseph, 2004] with analyze the structural weights across population subgroups for latent variables in TAM where graphic Perceived usefulness is equivalent with their structural weighted not Perceived ease of use which mean Perceived usefulness is higher in predicting intention to use. Regarding the influence of perceived usefulness, consumers' perception of smart meters' usefulness might be further increased by additionally providing value-added services for examples security or assistance services, home automation (Kranz, J & Ludwig, 2010). On the other perception of this characteristic on social influence where it can give effect to the user perceptions of usefulness when the supervisor use e-mail to communicate with employee and it can avoid miscommunication among the co workers .(Elena K & Detmar W., 1998) refer to the psychological researcher towards TAM model in the computer system technology state that perceptions usefulness of e-mail would be affected by perceptions of the social influence exerted by one's supervisor with respect to usage of particular medium. (Karahanna & Straub, 1999) where the study found that direct relationship between supervisor's use of Email and worker's use of email and the existence of a strong a relationship via perceived usefulness as a cognitive belief. On the other study, the author has using perceived usefulness in the different context where the research is focus on direct selling industry in Taiwan. The perceived usefulness is test in terms of self esteem, self affirmation, self actualization and professional development was an important determinant of both the attitude toward using and actual usage system. (Lin, n.d.)

Attitude toward Usage

This variable is defined as an individual's positive or negative feelings (evaluating affect) about performing the target behavior (Fishbein and Ajzen 1975, p.216). Attitude can be classified into main construct, attitude toward the object and attitude toward the behavior. According to Davis (1993), attitude towards usage defines as "the degree to which an individual evaluates and associated the target system with his or her job". It is the individual's overall evaluation of performing the behavior of interest (Ajzen, 2002). The attitude toward behavior relationship represented in TAM theory implies that, all else being equal, people form intentions to perform behavior toward which they have positive effect. Attitude behavior is adopted from theory of reasoned action where this theory state that attitudes develops reasonable from belief

people hold about the object of the attitude and belief links the behavior to a certain outcome or to some other attribute such as the cost incurred by performing the behavior .(Ajzen, 1991). Attitude towards usage has been identified as factor that guides future behavior or the cause of intention that ultimately leads to a particular behavior. This variable was influence actual use or acceptance of the computer system or technology. Based on Fusilier and Durlabhji (2005) study on college students in India, they found that the effect of attitude on intention appeared to be attractive with subjective norm rather than as main effect.

Technology Adoption

Technologies that facilitate collaboration via electronic have become an important component of day to day life. Thus several studies have examined the adoption of collaboration technologies such as voice mail, email group support system, services and so on. Given that adoption of collaboration technologies is not progressing as fast or as broadly as expected, it seems a different approach needed. New system or new technologies acceptances require input both the managerial or organizational level and the individual level. It is important to understand not only the end user beliefs, attitudes and intentions, but the management strategies, policies and actions which have significant effect on the successful acceptance of a technology (Bhattacherjee, 1998). Furthermore, for driver of an innovation or technology supplier, the acceptance of technology is only successful when both the individuals and organizations accept the innovation and also targeted adopters show the commitment by continuing to use the technology over times (Bhattaherjee 1998 & Rogers 2003).

Conceptual Model of Study

The theoretical base of the study framed the conceptual model to be comprised of variable of TAM where Perceived ease of use and Perceived Usefulness as Independent Variable, Attitude Towards Usage as moderator in this model. Technology Adoption consider as Dependent Variable. See the figure 1

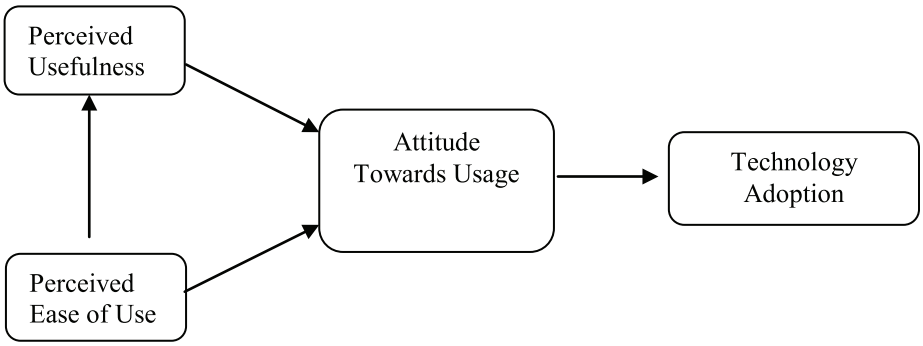

Figure 2: Technology Acceptance Model

Factor of consumer acceptance smart grid

Smart Grid is renewable energy where potential customer to use and adopt this technology is difficult. In IBM 2011, study that surveyed more than 10, 000 people across 15 countries, stated that over 30% of those polled which have never heard the term of this energy and more than 60% are unaware of smart grid or smart meter. These surveys show that people did not aware and do not understand about this energy. Looking at the difference barriers that delay the performance of smart grid products and services there seems to be lack of market acceptance (Hans C., Karoline K.,& Mortiz L., 2012).

From the 34% respondent give a reason not to adopt the new technology because of too costly to purchase and install another 17 % stated that the savings on electricity would to be small. Economic benefit is the most significant motivator for generate electricity at home.(Peter, Paul M., & Katherin M., 2012). This factor is supported by Evanson G. Baiya (2012), where the most important adoption consumer factor is economy and motivator is including current cost energy, availability of an effective and ease to use the technology, convenience incentive for consumers to change. All this factors are the most important thing for the consumer to adopt the new technology in their life.

For acceptance this renewable energy, consumer is very particular about the privacy issues and cost related to and also they concern towards electricity provision to poorer and vulnerable part of the population. It shows that the designing of this smart grid and service from beginning which is the way information communication and public opinion risk are key of successful smart grid on consumer acceptance. (OECD 2012). The other researcher found that consumer still depends on

utility provider or government to keep an eye on processing system of electricity and privacy concern is become important thing in terms of information security in smart grid system.(Amy P. A.L., Sugihara K. & Mukaidono M.,2012).Perceived, Perceived Ease of Use and intention to use have strong interrelationship and it is important to increase consumer's perception of the usefulness and ease of use of smart grid to enhance consumer's participation. Enhancing of perceived electricity saving effect, eco environmental friendliness, cyber-security safety and perceived ease of use will increase perceived usefulness and also perceived eco-environment has strong positive impact on perceived usefulness where it will increase perceptions of the smart's grid usefulness towards environmental benefits.. This result show that the awareness of the smart grid is important to the customer and will reduce customers worries through education and smart grid promotion.(Chan K. P, Hyun J. K.,& Yang S. K. 2012) . In Malaysia, smart grid is known as new electric energy and Malaysian still not aware about this energy. So that, this study will find what are the effectiveness this new energy towards Malaysian users?

Conclusion

The purpose of this paper is to review the literature on the extended of technology acceptance model theory in information system and to develop the research conceptual framework. This model of technology is not as widely available as one would have imagined in comparison to the field of innovation as a whole. Based on the limited number of articles published especially in Malaysia, we see the need to have more contributors and rooms provided by publishers. These papers also review the literature on acceptance customer towards smart grid as renewable energy and TAM model will be used as one of manner to improving customer acceptance of the smart grid also evaluate the relationship between independent variables and dependent variables.

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