Non-Discretionary Use of Information System and the Technology Acceptance Model

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Abstract

The purpose of this paper is to review literature used Technology Acceptance Model (TAM) as their theoretical foundation in non-discretionary use (NDU) environment. NDU means system that user who worked in the organisation must used the system without exception as long as they continue working in order to complete their job tasks. Three limitations of TAM used in NDU environment were indentified. Firstly, though TAM can be extended with new variables, this becomes unwieldy and does not embrace all the diversity of everyday experience in NDU. Secondly, the 'system usage' variable in TAM gave less meaning in NDU environment, and suggestions for its replacement are not able to fully capture the meaning of high quality in NDU. Thirdly, TAM can only measure the variables but not provide guidance how to achieve the variables. The paper ends with recommendations for future research into a very different type of framework for understanding and achieving high quality NDU.

Keywords: Technology Acceptance Model, Non-discretionary Use, Discretionary Use, System Usage, End user satisfaction.

1.   INTRODUCTION

Business processes in the organisations are increasingly dependent on information systems (IS) to capture all business activities that occur daily. The IS implemented in the organisation must be of sufficiently high quality that use of the system fulfil the need of all interested parties. For example, user acceptance can leads to system usage. It is because the primary nature of users' work has changed, converting manual into computerised processes, that qualify of use becomes every more important. Hodgson & Aiken (1998) and Keil et al. (1995) make it clear that information system managers must consider the human issues as well as technical issues. 'Users' here means those who use the system directly as part of their job function or those who make use of the outcomes produced by the system (Hartwick & Barki, 1994). User acceptance of information technology in the workplace remains complex and an important issue (Venkatesh & Davis, 2000). If the everyday experience of using IS is poor, user acceptance becomes low and the relationship between investment in information technology and organisational effectiveness will be jeopardised (Agarwal & Prasad, 1997).

In many cases, use of an IS is voluntary, and at the user's discretion. However, as work becomes more computerised there is less freedom for individuals to decide whether or not to utilize the technologies to complete their task. Organisations today tend to be more competitive when users have little discretion on whether they use the IS; usage is 'forced' (Ram & Jung, 1991). This is because many tasks in a modern workplace can be undertaken only by a computer and the specifications of many tasks do not give individuals the opportunity to select among alternate methods to complete their tasks. Therefore, the discretionary nature of IS use in the organisation is shifting to non-discretionary use (NDU). As a result, NDU has become an important issue to be considered by MIS researchers.

Many models have been developed to measure the user's acceptance or user's adoption like Diffusion of Innovations (DOI) (Rogers, 1983), Theory Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Theory Planned Behaviour (TPB) (Ajzen & Fishbein, 1980) and Technology Acceptance Model (TAM) (Davis, 1986). Those adoption models have been used to examine variables that motivate individuals to accept a new IS. Their dependent variable is typically system usage. The models originated from the social psychological literature (Rawstorne, et al., 1998). TAM was designed specifically for user acceptance towards IS. Therefore many studies related to usage towards IS will use TAM as their theoretical model.

However, it is not clear that such models are sufficient to help us understand and achieve high quality NDU. Each model tends to cover only a limited range of factors, and everyday experience in NDU is usually much richer and wider in scope. The challenge that researchers have is to identify the factors that are important in high quality NDU and to provide useful guidance to achieve it.

This paper first reviews the literature on NDU environment of IS, and augments this with one detailed presentation of everyday experience. It then examines the TAM model and various extensions that could make it serviceable in analysing NDU. Davis (1986) clearly stated that TAM is meant for discretionary use and must be extended for the NDU environment. The capability of TAM in NDU is then discussed, to identify some limitations. Lastly, recommendations will be made for future research.

2.   NON-DISCRETIONARY USE (NDU) AND DISCRETIONARY USE (DU)

Non-discretionary use (NDU) of information systems (IS) differs from discretionary use (DU). In discretionary use, the user decides whether to use the IS or not, depending on a number of factors like whether they find it useful or easy to use, and the amount of use can be an indicator of the quality and the success of the IS. In NDU, the IS must be used whether its users like it or not, so the amount of use is always 100% and this cannot indicate the quality of experience in using IS. Here users perceive use as mandatory (Agarwal & Prasad, 1997; Hartwick & Barki, 1994; Venkatesh & Davis, 2000).

NDU is defined as "one in which users are required to use a specific technology or system in order to keep and perform their job" (Brown, et al., 2002). Some of the reasons in putting the system as NDU are to increase the usage and to overcome the first time difficulty towards the system (Agarwal & Prasad, 1997). It is also due to legal requirements, a regulatory body or an agreement with another organizational partner (Chae & Poole, 2005). NDU systems are often complex, integrated systems on which an organisation relies heavily, such as ERP. As for example, The Accounting Firms are using User Business System (UBS) software to capture all monetary transactions to produce financial statements. It is now hard to use the manual accounting book of previous years. If one department did not use the system it will affect other departments too. As a result the system outputs are not updated and consequently will provide wrong information to management for decision making.

Recently, there has been quite an extensive literature discussing NDU (also called mandatory use) (Sorebo & Eikebrokk, 2008). Research indicates that in NDU environments, an assumption is made that users will accept any changes to use the new IS because they wish to continue working in the organization (Leonard-Barton & Deschamps, 1988). Users need to use the system to complete their tasks or job functions (Ram & Jung, 1991) where they have no alternative of not using the IS. It happened because users have decided to work in the same organisation with the same environment (Brown, et al., 2002) and the usage is the organisational requirements (Agarwal & Prasad, 1997; Hartwick & Barki, 1994; Venkatesh & Davis, 2000). Such users would be motivated to use the system not necessarily because they have positive attitudes towards it but instead because they feel encouraged to use it by management. Organisation also must not force users towards system usage or to adopt the

innovation because it will lead to user resistance towards the system (Ram & Jung, 1991). However, sometimes users might gain status and influence within the work group when they used the system and thereby improve their job performance (Venkatesh & Davis, 2000). Some researcher find a mix of non-discretionary and discretionary (or voluntary) usage in ERP (Amoako-Gyampah & Salam, 2004), where NDU refers to meeting minimum requirements related to their job functions and discretionary use is where usage is beyond this.

Most discussions of NDU in the literature, however, have not yet captured many of the everyday experiences that are important in real-life NDU. One of the authors experienced working in NDU environment. She found the following factors which are not adequately discussed in the literature. The factors are divided into two categories on how to achieve system usage and the end-user satisfaction (EUS). In relation to achieve the system usage, first, usage is related to a number of tasks must be undertaken to complete job task. Second, when people join the organisation, management must explain to them from the day they join about how the NDU system must be used to complete job task. Third, staff helping each other use the IS, not just out of generosity but because the whole operation would be adversely affected. Fourth, the author would use the system when she felt comfortable and happy with the working environment where the boss and other staff treat her well and in good manner. Fifth, is the gaining of life working experience, especially for fresh graduates. The longer time they work with the same organisation, the more life working experience they will be able to gain, so they are motivated to stay and get used to the mandatory IS. Sixth, another motivation to remain is that loyalty to the organisation over five to ten years can bring rewards. Such compensation plan must be known to users so that they will feel appreciated for the many efforts they put into their working activities. Whereas the second categories that is to achieve end user satisfaction (EUS), the first issue is, the ability of gaining helps from others when they faced any difficulties in using the system. Second, easy to obtain any information required at anytime and lastly is on the learning and training issues specifically related to their job functions.

Hartwick and Barki (1994) believe that more research is needed in the area of NDU. This paper suggests that a true understanding of NDU requires attention to many such 'everyday' issues as well as those discussed in the literature. This requires a conceptual framework and model with which to understand NDU.

3.   TECHNOLOGY ACCEPTANCE MODEL (TAM)

The Technology Acceptance Model (TAM) (Davis, 1986; Davis, et al., 1989) is a well known model that deals with user adoption of information systems. It usually assumes discretionary system usage environment (Brown, et al., 2002), but it might be extendible to NDU. The main objective of TAM is to provide a foundation to know the impact of external variables on internal beliefs, attitudes and intentions (Legris, et al., 2003) towards system usage.

3.1   The Technology Acceptance Model

Davis (1986) used Fishbein and Ajzen's (1975) Theory Reasoned Action (TRA) as a theoretical foundation in developing TAM. TRA was a well known model of human behaviour from psychology, which links subjective norms, attitudes, intentions and beliefs as determinants of behaviour. TRA is for any kinds of human behaviour, and its authors expected its variables to be adapted for specific types. In attempting to model the behaviour in using IS, Davis retained attitudes and intentions, and defined two types of beliefs: perceived ease of use (PEOU) and perceived usefulness (PU). Figure 1 shows TAM original model with the causal relationships between all its variables.
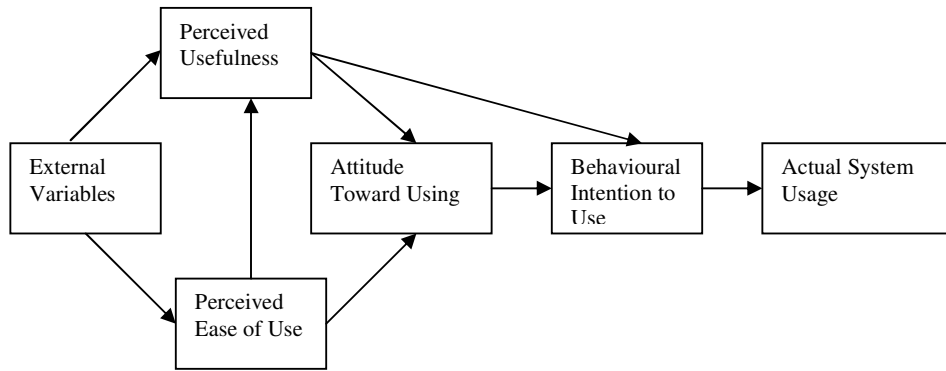
Figure 1: Technology Acceptance Model (Davis, et al., 1989)

Two beliefs, as independent variables, were identified by Davis (1986) during his PhD studies, perceived usefulness (PU) and perceived ease of use (PEOU), which is hypothesized to be fundamental determinants of user acceptance of information system (Davis, 1986, 1989). PEOU is defined as the degree to which an individual believes that using a particular system would be free of physical and mental effort. PU is defined as the degree to which an individual believes that using a particular system would enhance his or her job performance (Davis, 1986). Support for the ideas that PU and PEOU were two beliefs that influence user intentions to accept new technology is extensive (Davis & Venkatesh, 1995, 1996; Mathieson, 1991; Szajna, 1994; Taylor & Todd, 1995). Other support included the PEOU as an antecedent of PU and indirectly contributed to attitude formation towards system usage (Gefen & Straub, 2000). Many empirical studies found that PU has consistently been a strong determinant of usage intention while the PEOU has a less consistent effect on intention.

Two other variables were identified; behavioural intention and actual system usage. TAM stated that PU and PEOU determine an individual's intention to use a system. Whereby, the intention to use is treated as a mediator of actual system use.

TAM theorises that all other variables are 'external' and feed into PEOU and PU. In his thesis Davis (1986) identified system characteristic as an external variable, because managers have a say or controlling power to decide what types of system characteristics need to be included. Other researchers listed out other the types of external variables.

TRA included 'subjective norms' (SN) as a variable in its model, which is (Fishbein & Ajzen, 1975) "the person's perception that most people who are important to him think he should or should not perform the behaviour in question." In IS use, these might be colleagues and superiors. Because TAM is tested in new system design and implementation stages, therefore the users will not receive any information from referents such as superiors, whether individuals or groups, and hence TAM excluded subjective norms from its model.

3.2   Other Empirical Studies on Technology Acceptance Model (TAM)

Since year 1986, many empirical support for the robustness of the TAM as a predictor of intended systems usage has been given by a number of researchers (Adams, et al., 1992; Davis, et al., 1989; Sambamurthy & Chin, 1994; Subramanian, 1994). Types of system studied by MIS researchers on TAM can be classified into communications systems, general purpose systems, office system and specialized business systems (Lee, et al., 2003). Other researcher reclassified systems into three categories; office automation, software development and business application (Legris, et al., 2003).

Further studies after 1986 was paper written by Davis in 1989. This paper published results on validated measurement scales to measure PEOU and PU. These measures can also be used in other scenarios like application settings, after system implementation to detect any problems occurs, in organisations to make selections between software suggested by different vendors, examining ratings of different user groups for the same software and for measuring system success (Adams, et al., 1992). Other research such as Subramanian (1994) applied TAM in two mailing systems, Sambamurthy and Chin (1994) used TAM in group attitude towards using GDSS, Davis (1993) replicated his study (Davis, et al., 1989) using e-mail and a text editor while Adam, et al. (1992) studied TAM in word processors, graphics, spreadsheet, e-mail and v-mail.

As many studies being done, the findings are not consistent. Some researchers took the opportunities in trying to come out the consistent idea about TAM. Meta analysis is one way to achieve the standardisation of result in research. Meta analysis is a way of combining findings of all studies to end with the conclusion of consistent ideas. Since findings from previous studies have a long list, researchers combine it into groups. Lee, et al. (2003) suggested four periods of TAM chronology; introduction, validation, extension and elaboration. Validation period are for all papers that did studies to validate the original model without augmenting any variables or constructs into the model. All studies were done to validate TAM instruments, a test-retest reliability of PU and PEOU scales, found that instruments are valid in test-retest analysis (Hendrickson, et al., 1993), Szajna (1994) examined how well TAM could predict future behaviour. The results showed that both PU and PEOU were able to predict the future behaviour of the software evaluation and in choosing software packages among several options. It is important due to the increases of pre-packaged software (e.g., Microsoft words, Microsoft Excel, database management system) used in the organisations.

As for current interest on TAM it covered the internet usage and website usage. Results from these studies confirmed the suitability of PEOU and PU in an online context, and found out that substantial evidence for the intrinsic enjoyment that many consumers have when surfing the web (Moon & Kim, 2001). During validation period, the questions whether TAM instruments are powerful, consistent, reliable and valid still put on hold. It is because researchers will every time check for its validation (Legris, et al., 2003).

3.3   Extending TAM

Since 1986 TAM has been extended by MIS researchers so that it can be used in different environments, other than those used when Davis developed the original TAM. Either additional antecedent factors or new external variables were suggested. The important issue is how to separate out things that should be separated and how not to separate out things that should not be separated. Attempts to extend TAM have generally taken one of three approaches: by introducing factors from related models, by introducing additional or alternative belief factors, and by examining antecedents and moderators of perceived usefulness and perceived ease of use (Wixom & Todd, 2005).

The first one added to TAM is known as output quality (Davis, et al., 1992). Other example of added external variables include developer responsiveness (Gefen & Keil, 1998), systems features (Shim & Viswanathan, 2007), organisational support (Igbaria, et al., 1996) and user perceptions concerning management support, internal and external computing support, and internal and external computing training (Igbaria, et al., 1997). Government support and compatibility were added as external variables in Calantone, et al. (2006).

Researchers have suggested long lists of external variables, more than 70 (Yousafzai, et al., 2007), since TAM was first introduced. However this gave confusion among IS communities. They reclassified it to four characteristics; organizational, system, users' personal and other

variables. So TAM is no longer considered a parsimonious model since, after taking into considerations all new additional variables, it become a rather complicated model. See, for example the latest TAM3 suggested by (Venkatesh & Bala, 2008).

4.   STUDIES OF TAM IN NON-DISCRETIONARY USE ENVIRONMENT

Most previous studies ot TAM focused on discretionary use (Davis, 1989; Gefen & Keil, 1998; Henderson & Divett, 2003; Hendrickson, et al., 1993; Hubona & Burton-Jones, 2003; Mathieson, et al., 2001; Subramanian, 1994; Szajna, 1994). Davis (1993) suggested that TAM need to be extended if it would be used for NDU. One reason for this is that users would be motivated to use the system not necessarily because they have positive attitudes or believe it to be easy to use or useful, but instead because they feel encouraged to use it by management. So TAM was extended for NDU (some call it mandated or mandatory use) by adding new external variables such as subjective norms, system quality and computer self-efficacy (Adamson & Shine, 2003); image, job relevance, output quality and result demonstrability (Venkatesh & Davis (2000).

Subjective norms also include influences by managers, peers and consultant for NDU (Ward, et al., 2005). Such a motivational construct similar to spirit of Fishbein and Ajzen (1975) 'subjective norm', which captures the individuals' belief related to others in performing a given behaviour and other motivational factors toward it. The elements of subjective norms significantly relates to intention prior to the system development in the case of non-discretionary users (Davis, 1993; Hartwick & Barki, 1994; Venkatesh & Davis, 2000) whereas for discretionary users the views of others are less likely to influence their action instead their own attitude play its part (Hartwick & Barki, 1994).

While Brown, et al. (2002) explored how much of original TAM can be used for NDU, others extended it. Some of the extensions of TAM to NDU replace the 'IS usage' dependent variable with usage behaviour, while others replace it with end user satisfaction.

4.1   Validation of Original TAM in NDU

Brown, et al. (2002) applied unextended TAM to a system called Computer Banking System (CBS) in the NDU environment in the banking industry. Users were given training before the actual implementation. Once CBS was implemented, the old system was stopped. This research paper studied this process in relation to the Theory Planned Behaviour (TPB) and two versions of TAM, original TAM and what they call 'parsimonious TAM', which omits the attitude variable. Brown et al. found two main results.

One result was that the primacy of PU over PEOU is reversed in NDU. Whereas in discretionary use, PU is a stronger determinant of behavioural intention than PEOU, in NDU, PEOU becomes the primary determinant of behavioural intention.

The other result concerned the "attitude" variable in original TAM. The only relationships that were found to be significant were PEOU to PU, and PU to attitude. Other relationships were found to be nonsignificant, especially that from attitude to intention to use the system. This means that in NDU settings, PU is important in encouraging positive attitude about use, but that attitude is not important in influencing their intention to continue using the system. Thus, in original TAM applied to NDU, there was no significant antecedent factor for intention to use the system.

This does not mean, however, that attitude is unimportant in NDU. Rather, attitude is antecedent to a different variable, not found in original TAM. Melone (1990) found that attitude is a critical factor in NDU environments because it represents the degree to which

users are satisfied with the system, which is discussed later. Brown et al. added that in NDU settings, PU is important in encouraging positive attitude about use.

4.2   Usage Behaviours as Dependent Variable

4.2.1 Rawstorne, et al. (2000)

Rawstorne, et al. (2000) studied on the issue of predicting and explaining NDU behaviour using the original TAM. Prediction can happen on its own but not for explanation. The explanatory power can only be shown once prediction is established as being accurate. Data were collected from one type of worker (nurses) and one type of information system known as a Patient Care Information System (PCIS). The workers were not given any choices whether to use the system or not, therefore the system is classified as NDU. Questionnaires were distributed from the same nurses on two different occasions since the study based on longitudinal design.

The research was conducted on two different occasions or time frame since the study based on longitudinal design to identify issues in predicting and explaining mandated IS use using the TAM and the TPB. Any model is able to have the explanatory power once the prediction is established as being accurate (Sutton, 1998). The data for the study were collected from one type of worker (nurses) and one type of information system known as a Patient Care Information System (PCIS). The workers were not given any choices whether to use the system or not, therefore the system is classified as NDU. So the authors replaced 'system usage' by 'usage behaviours' as a dependent variable. In the case of the Nursing Care Plan (NCP) in the PCIS, three special usage behaviours were measured: updating the care plans as changes occurred, using the care plans for planning care delivery and using the care plans as an educational tool for students and new graduates.

TAM could not explain multiple usage behaviours because if different behaviours were measured, it is unlikely that the same predictor items could predict all the behaviours. However, if the three behaviours were taken separately, TAM was able to predict two of them but failed to predict updating the care plans as changes occur. Instead of updating when changes occurred users batched updates to the end of the day or week. The reason was due to the formation of intention, which Davis (1986) says requires ample time and knowledge to understand the new system.

Another issue came out from the study is about the determinant of intention are associated with future usage. Evidence from previous study found out that beliefs and determinants of current use are different to ongoing use (Karahanna, et al., 1999). The result from this study indicated that "usage behaviour can be predicted to a reasonable degree between two or four months after the commencement of use".

The result shows, TAM can sometimes be useful predictive and explanatory tools in NDU environment, but at other times it cannot be.
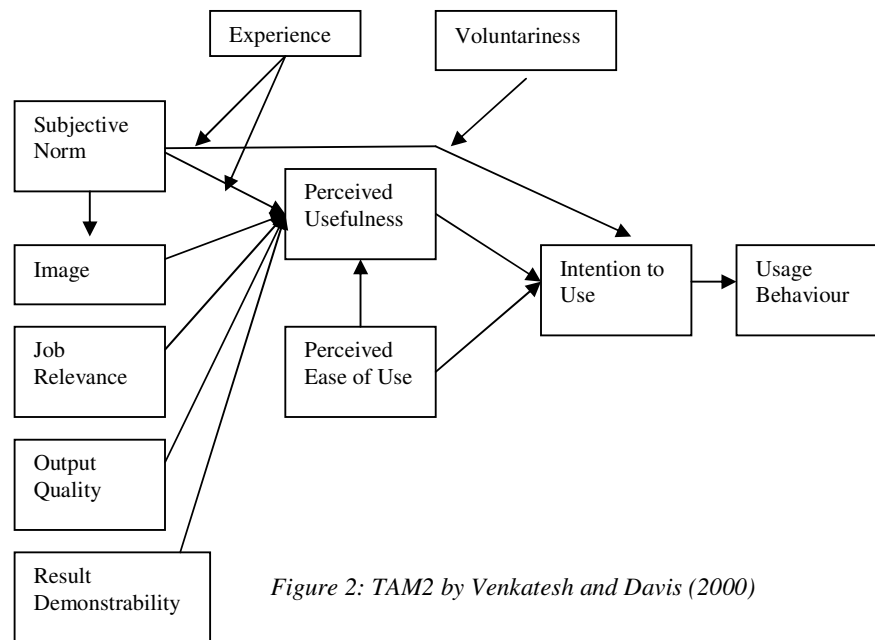
4.2.2 Venkatesh and Davis (2000)

Figure 2: TAM2 by Venkatesh and Davis (2000)

Venkatesh and Davis (2000) extended TAM into new model known as TAM2 (Figure 2), which attempted to make TAM more relevant to NDU and also identify determinants of perceived usefulness. They incorporate key determinants of PU on two perspectives; social influences (subjective norm, voluntariness and image) and cognitive instrumental construct (job relevance, output quality, result demonstrability and perceived ease of use). Image refers to "degree to which use of an innovation is perceived to enhance one's status in one's social system", job relevance means "individual's perception regarding the degree to which the target system is applicable to his or her job", output quality means "what tasks a system is capable of performing and how well the system performs those task" and result demonstrability is the "tangibility of the results of using the innovation" (Moore & Benbasat, 1991) means users will accept system if it could attribute gains towards job performance. Subjective norm is "internalisation; in which people incorporate social influences into their own usefulness perceptions, and identification; in which people use a system to gain status and influence within the work group and thereby improve their job performance".

The study was carried out in NDU and DU environments using longitudinal design in order to understand the effects of those key determinants in a situation where users experience increase over time with the system. Four companies (different industries) were involved in data collection; two for NDU and two for DU and measures were taken at three points of system implementation; pre-implementation, one month and three months post implementation.

All the hypothesis made for TAM2 were strongly supported across the four organisations and for all the three implementation points. The subjective norm also significantly had direct effect on intentions over and above perceived usefulness and perceived ease of use for NDU but not for voluntary usage. The direct effect will be stronger prior to the implementation and during early usage, it became weaker over time as users gained more experience with the system that provides a growing basis for intention towards ongoing use. As for the results of job relevance, the study found that in assessing the usefulness of the system, it will be

affected by how individuals match their job goals with the consequences of system use (job relevance). It is also similar with task characteristic and technology characteristics in other studies (Davis, et al., 1992; Goodhue & Thompson, 1995). Lastly, as for other effect between subjective norms towards image, image towards perceived usefulness, result demonstrability toward perceived usefulness, studies showed that all were significant throughout all four organisations and all three points of implementation.

4.3   End User Satisfaction as Dependent Variable

4.3.1 Rawstorne, et al. (1998)

Rawstorne, et al. (1998) proposed an integrative model of information system acceptance in NDU (they refer as mandatory) environment. The end result is to measure end user satisfaction (EUS). New variables were incorporated into the model of a combination with TAM and TPB's variables. Experience using the computers is linked with positive attitudes towards computer. In this paper they argued that user intention is not suitable in NDU environment because the variable will not be used in testing the model. But yet, it is still being measured to prove the argument that measure user intention is in appropriate in non-discretionary adoption environment. They change it to symbolic adoption means "the mental acceptance of an idea, distinct from attitude". In order to test the hypothesis for the proposed model, a longitudinal study has been employed where data were collected from about 500 participants that used a system known as computerised patient care information system (PCIS). Users were involved directly through out the system development. They did not report any result since the project is still in progress when it was presented in 1998.

4.3.2   Adamson and Shine (2003)

Adamson and Shine (2003) did their study in the Bank treasury where the old and well practiced system was to be replaced by the new system. The system is classified as a non-discretionary (they called it mandatory) type. The new system was develop by using the end-user approach means user will participate and contribute at all stages of the design process consist of specification of system objective, evaluation criteria, pilot study and user support. However, after few months of implementation, there were problems occurred like a high turnover of staff, complaints from front and back office users and some conflicts about the system. Due to those reasons, the management would like to measure end user satisfaction (EUS) towards the new implemented system, rather than usage and anticipate for productivity. It is because in a non-discretionary environment technology usage is determined by the organisations' aim and objectives. The study used TAM2, developed by Venkatesh and Davis (2000), where the model is being extended to measure end user satisfaction (EUS), lead to acceptance and subsequently to increase usage. They studied additional variables; attitudinal dimension (measure attitude formation towards new technology, consist of subjective norm, computer self-efficacy and system quality), perceptual dimension (perceive ease of use and perceive usefulness) and behavioural dimension (end user satisfaction) by assumption once user satisfied it will use the system. They define subjective norm as "individual's subjective norm are determined both by peers and superiors' influences", computer self efficacy is "individuals' belief concerning their ability to perform specific tasks successfully, given a degree of expended effort and persistence in the face of challenging situations" while system quality as "centres on an acceptable standard for software quality. The major sources of poor system performance are software bugs and errors, hardware or facility failures caused by natural or others causes and poor input data quality. Pursuing perfection is economically unfeasible (information systems must be acceptably secure, accurate and reliable)".

All attitudinal dimensions showed positive and significant relationships to perceptual dimension. Systems quality was the strongest relationship with PU and PEOU. Furthermore, PEOU was stronger influence toward EUS rather then PU toward EUS. Other significant contributors to satisfaction were demographic variables; age, position in a company and the employment duration. The study also concluded that the computer self-efficacy and EUS play a major role in new technology acceptance where it must be considered in designing information system for NDU environment. Computer self efficacy also could increase the individual's performance. Furthermore, any users with higher computer abilities are willing to accept and use new system.

4.4 Overview of TAM Studies in Non-discretionary Use

Brown, et al. (2002) show if the original TAM were used in NDU environment, the results gave different patterns of relationships. When attitude variable was excluded from TAM it shows PEOU as primary determinant while when attitude variable was included it shows PU as a primary determinant. The relationship between attitude and intention was absent since it is not relevant in NDU. The study was able to validate the original TAM where it was not suitable for NDU and they suggested that TAM-like models "do not replicate the relationships when usage is truly mandated". In addition the study still measured system usage even though the usage in NDU is hundred percent.

Rawstrone, et al. (2000) managed to prove that TAM cannot act as a predictor and as an evaluator in multiple users' behaviour. Any models must able to predict accurately in order to be able to explain. They measured 'user's behaviour' instead of 'system usage' since the study in NDU environment the system usage variable is not suitable to be measured. They identified the specific actual behaviour to be measured. They found that one predictor cannot measure multiple user behaviours. As for Venkatesh and Davis (2000), they also measure usage behaviour. New additional variables were added to be used in NDU environment.

Rawstorne, et al. (1998) and Adamson and Shine (2003) did their study to measure end user satisfaction specifically in NDU environment. New variables were suggested in NDU context.

5. LIMITATIONS OF TAM IN NDU

The arguments about TAM are on the issue of intentions and other variables. "Intention" needs to be excluded (Brown, et al., 2002; Hartwick & Barki, 1994; Sorebo & Eikebrokk, 2008) since in NDU the variables will not give any. The assumption made for behavioural intention is that when users intent to perform any activities, there are no limitation on its act. However due to organisational requirement, time and constraint the act are very limited. Research shown that behavioural intention gave less value to indicate either system is successful or not in a NDU (Brown, et al., 2002; Hartwick & Barki, 1994). It is not a matter of user have intention to use or not but the more important thing are whether are they satisfied to use the IS (Adamson, et al., 2003). If not it may leads to low morale, attempt to sabotage the system or poor customer services and blaming the IS did not provide information they needed (Markus, 1983). The suggestion was made to include subjective norm (influence by superior) and shown that subjective norm had a direct effect in intentions for NDU. However, the direct effect weakens over time when users had gained more experienced in using the system (Hartwick & Barki, 1994; Venkatesh & Davis, 2000).

As the above studies, it shows that TAM had some limitations when it was used in NDU environment. The limitations are not saying that TAM cannot be used totally in non-discretionary use but have to do some adjustment in terms of adding more variables or replacing any variables that may gave less meaning if it still reflected in the model. Three limitations were identified and details discussions were made.

5.1   Limitation 1: Insufficient external variables

Perceived usefulness (PU) and perceived ease of use (PEOU) are too undefined to be relied on in practical analysis. They need to be extended by adding additional external variables.

TAM is used to measure system usage in discretionary use environment and the degree to which it affected the beliefs (PU and PEOU) and various other factors that were added to other version of TAM. Most studies on TAM are either validating the original model or extending the model with new variables. About 70 external variables were identified in extended TAM since it was introduced in 1986 (Yousafzai, et al., 2007). As for studies specifically focus on TAM, the external variables includes; subjective computer experience and objective computer experience (Rawstorne, 1998); image, job relevance, output quality, result demonstrability (Venkatesh & Davis, 2000); system quality and computer self-efficacy (Adamson & Shine, 2003).

However, there are two problems with extending even to 70 variables. One is that the whole becomes unwieldy. Not only are Yousafzai, et al.'s variables too numerous to provide a usable analytical tool, but many of them overlap with others, and many are ambiguous or too general in meaning. Also, some of the characteristics of high quality NDU identified earlier cannot be easily incorporated into even these 70. For example loyalty issues are missing. Though, in principle, such issues could be added, this would compound rather than resolve the problems.

5.2   Limitation 2: Inappropriate dependent variable

As has already been discussed, 'system usage' as dependent variable is inappropriate for NDU. TAM has been shown to be less explanatory when system use is considered to be as non-discretionary as compared to discretionary use (Brown, et al., 2002). That is why TAM is more suitable to be used in discretionary use where usage in not hundred percent and for this case the system usage variable could give some meaning to be included in the model. In order to overcome the concern, the system usage needs to be replaced with more suitable variable such as usage behaviour (Rawstorne, et al., 2000, Venkatesh & Davis, 2000) or end user satisfaction (Rawstorne, et al. 1998; Adamson & Shine, 2003). As the latter have shown, EUS is significantly related and relevant to performance (Gelderman, 1998) and therefore it has gained its place as a reliable tool for evaluating information systems (Baroudi & Orlikowski, 1988). Dissatisfaction with an IS may decrease job productivity (Kim, 1989).

However, as is clear from the earlier discussion, neither usage behaviours nor end user satisfaction are sufficient to embrace all the diversity of aspects that are important in high quality NDU.

5.3   Limitation 3: Offers little guidance

The TAM approach allows us to measure the external and dependent variables and link them together, but it cannot help management in planning to achieve high quality NDU. In the real world of NDU, it is not just a matter of measuring or predicting or evaluating user satisfaction (or whatever the output variable is). It is necessary to also do something about it or to take further action once results were obtained. As for example, in the organisation when management make use of TAM measurement scale and obtained the result that system usage is very low. What are the next steps? What action can be taken? How to increase the system usage or how to increase the user satisfaction or any output variables? TAM cannot give the answer to those questions. It means TAM cannot help the management to plan on how to increase the system usage or the user satisfaction. Management surely would like to know what would be the best way to achieve the system usage or how to achieve the usefulness and

ease of use rather than just knowing or obtained the result that the system usage is low. Evaluation or measurement can be useful, as part of doing something about it, but it still cannot resolve certain issues. So we do not need to "get rid of TAM totally". But this problem cannot be solved either of the two solutions on their own (adding more independent variables, mediator or replacing the dependent variable), because the very structure or the nature of TAM is based on the assumption that the main role is to evaluate. Rather, TAM (if we want to use it in any form) needs to become just one small part of a larger picture.

6   ACHIEVING HIGH QUALITY NON-DISCRETIONARY USE

As already mentioned, achieving high quality NDU is an important criterion in the success of organisations. Because of its limitations, it is doubtful whether the TAM approach is fully useful as a tool to address NDU issues, even when extended or modified. What is needed is a framework for understanding NDU that offers adequate diverse categories to support us in thinking about everyday experience of NDU, is not unwieldy and offers meaningful guidance.

Basden (2008) has suggested an approach to IS usage which makes use of the multi-aspectual philosophy of Herman Dooyeweerd. IS usage is seen as human functioning in a number of aspects, each of which is a distinct sphere of meaning. Each aspect is centred on a kernel meaning that may be grasped with our intuition, rather than by theoretical thought; this recommends the aspects as a tool for use in analysis. Each aspect may be used as a category of issues that are important in human activity in general, and thus also in NDU in particular. The aspects are around fifteen in number, which is not too unwieldy in practice. Moreover, the aspects are also spheres of law, each being able o offer guidance on what should be sought and what should be avoided for successful life and work. Again, these general laws might be applicable to NDU.

It is intended that Dooyeweerd's aspects will be employed to formulate a framework for understanding NDU and achieving high quality NDU. Empirical study based on a Dooyeweerdian framework will be carried out to identify how management could evaluate the quality of NDU and take action to achieve it.

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