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Investigating a Theoretical Framework for E-book Technology Acceptance

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Abstract

Nowadays, the schools pay attention to use the technology, which is still in growing. Electronic book or e-book technology becomes as an important tool in learning to help the school children in their learning. Although a few schools have adopted the e-book technology in Malaysia, consequently this research purpose is to provide more investigation to the literature review of e-book technology acceptance in Malaysian schools. This study introduces a new integration of Child Computer Interaction (CCI) and Technology Acceptance Model (TAM) to address the acceptance of e-book technology by school children at schools in Malaysia. This study discusses and explains the key idea of by what method to formulate a theoretical framework of technology acceptance. In the theoretical framework, the main constructs that are expected to influence Behaviour Intention (BI) use of e-book at Malaysian schools will be proposed and discussed. Therefore, it is hoped that this study has presented some insights and directions for future research to demonstrate the relationship existing in our new proposed research theoretical framework where the schools by paying attention may take an action in order to achieve a better e-book technology acceptance decision-making.

Keywords: E-book technology, Child computer interaction, CCI, Technology acceptance model, TAM, School children, Behaviour intention, BI

1. Introduction

The electronic book or e-book term is defined as digital texts whose basic structure simulates traditional books, however, they are displayed on an electronic display (Felvégi and Matthew, 2012). The e-book is a gorgeous invention, which allows users the freedom to read almost everything, almost everywhere, at almost any time.

Cavanaugh and Cavanaugh and Cavanaugh (2002) characterized the e-book by software and hardware: software has texts, pictures, and other information while hardware, called as a reader, is a special computer style device or program that displays the digital book on a screen.

The e-books can be stored in the storage media. As mentioned in a study by Lester et al. (2007), usually the storage media, such as CD-ROMs, Floppy Disks, and Hard Disks are used to store the e-books as PDF format. Besides storage media, the users can read e-books directly from websites or download them into several devices like PCs, Laptop and smart phones because of the advantage of high-speed internet as a result of which they are adding features to e-book technology using everywhere and every time.

An attempt to make education free for all and to eliminate illiteracy, e-books technology are penetrating developed and developing countries. According to Noor *et al.* (2012) study in Terengganu state, in 2009, e-books within laptops were distributed to school children. It was totally 25,000 students.

The e-books were distributed to Terengganu state primary schools, which was the first state in Malaysia and whole of South East Asia. The digital textbooks have been developed by The Institute of Language and Literature. The government of Terengganu insisted in achieving its goal to update the learning process by using technology in all schools in the state.

The e-books technology usage at schools is relatively new in Malaysia. Since the state government has invested ultimately to this move from paper to technology, it is strongly felt that an investigation should be conducted on the effects of e-books technology to primary schools.

2. The Objective of the Study

Malaysia is of particular interest in the field of educational technology implementation because Malaysia

has been one of the fastest growing economies of the past two decades, going from a primarily agrarian economy and society to becoming a regional information technology (IT) powerhouse in a remarkably short time. The purpose of this system is to support learning process and activities in classroom and expose students to Information and Communication Technology (ICT) (Fahmy et al., 2012; Roslina et al., 2014). Therefore, this study investigates the integration of theoretical model that can explain the acceptance of e-book technology in particular to identify the potential barriers and facilitators. Thus, this study discusses and explains the key idea of by what method to formulate a theoretical framework of technology acceptance?

3. Related Works

In this section, several well-known theories and models that are useful for the theoretical background will be discussed for proposing an appropriate model for e-book technology. It discusses and explains the key idea of by what method to formulate a theoretical framework of technology acceptance. In the theoretical framework, the main constructs that are expected to influence behaviour intention use of e-book technology at Malaysian schools will be proposed and discussed. In order to achieve better methods of predicting and assessing users' response to new technology, it is crucial for researchers to search an answer to the question of why people accept technology. The user acceptance was defined by Dillon and Morris (1998) as demonstrable willingness within a user group to exploit IT for the tasks it is designed to support. The concept of acceptance may be applied to situations where designers or procurers will employ a technology without providing evidence of use. Additionally, it can also be applied to situations where technology will be used for unintended purposes. Several theories and models of technology acceptance were proposed and extended for the past decades. Because of the importance of acceptance, user attitude and behaviour toward increasingly adopted IT, several theories and models that try to understand, clarify, and expect the new technologies' acceptance among users.

3.1 Theory of Reasoned Action (TRA)

Fishbein and Ajzen (1975) formulate the relationship between user's Behavioural Intention (BI) on one hand, and user's Attitude (A) and Subjective Norms (SN) as $BI = SN + A$, on the other hand, assuming that if the intention of users is to achieve a particular behaviour, they most likely will achieve that behaviour.

3.2 Theory of Planned Behaviour (TPB)

Theory of Planned Behaviour (TPB) made necessary amendment by the original model's limitations in addressing with behaviours over that people have deficient volitional control. Moreover, TPB merges some major concepts from social and behaviour sciences. In addition to

that, it described these concepts in a manner that allows prediction and understanding of specific behaviours in specified contexts (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975).

3.3 Technology Acceptance Model (TAM)

In 1986, Davis Jr (1986) established a model called TAM that explains users' acceptance and use technology. Since then it became a one of the most established models for technology acceptance. It specifies main factors of technology acceptance. This makes useful in explaining or predicting a person behaviour across a various collection of end-user computing technologies and user groups. TAM advocates that when a new technology is presented to users, numerous factors influence users' decisions regarding when and how they will use it. According to Davis Jr (1986), these factors are Perceived Ease Of Use (PEOU) and Perceived Usefulness (PU) of technology. The PU is defined as the extent to which a user thinks that the performance of his or her task performance will be improved by employing a specific system. The PEOU is defined as the extent to which a user thinks that employing a specific system would be effort free. TAM has been applied to situations where a new technology is presented to users.

3.4 Combined TAM and TPB (C-TAM-TPB)

Both Taylor and Todd (1995) argued that, TAM is unclear in predicting behaviour of inexperienced users. Therefore, they have mixed TAM and TPB to form a hybrid model called combined TAM and TPB (C-TAM-TPB). This hybrid model is proposed to explain the behaviour of experienced and inexperienced users in IT usage. Increased experience is more salient with attitude toward behaviour, perceived behavioural control, and perceived usefulness except subjective norms. TAM was added by two factors: perceived behavioural control and subjective norm to provide a full test of the important constructs of IT usage, because of their predictive utility in IT usage research and their extensive use in social psychology.

3.5 Technology Acceptance Model 2 (TAM2)

Technology Acceptance Model 2 (TAM 2) is theoretical extension and developed from TAM theoretically by Venkatesh and Davis (2000), which was assessed with longitudinal data and demonstrates the perceived benefits and usage intentions with regard to social influence and cognitive instrumental processes. TAM2 embodies extra theoretical constructs into the existing TAM such as spanning social influence processes (subjective norm, image, and voluntariness); cognitive instrumental processes (job relevance, result demonstrability, output quality and PEOU).

3.6 Technology Acceptance Model 3 (TAM3)

From an organizational perspective, the most significant concern is by what method the managers make knowledgeable resolutions concerning interventions that can contribute to more adoption and efficient deployment of IT. A few studies in the literature concerning IT implementation addressed the interventions role to assist such decision-making, which made by managers (Venkatesh and Bala, 2008). Specifically, it is important to understand that how different interventions effect the identified determinants of IT implementation and utilization.

A gap is dealt in the literature by extracting from the extensive research on TAM, the work that focuses on the determinants of determinants of PEOU and PU. Furthermore, i) promote a complete homological network (integrated model) of the determinants of user level (IT) acceptance ii) to conduct a study for testing the proposed integrated model; and iii) to present a research agenda that highlights probable pre- and post-implementation interventions that can boost the adoption of employees and utilization of IT. These theories and models define their theoretical determinants of intention and/or usage of IT.

These theories were found to be most popular, influential, and important theories and models for technology acceptance.

3.7 Hedonic Information Systems

The aim of hedonic information systems is to give self-fulfilling than instrumental value to the user are robustly connected to home and entertainment activity focus on the fun aspect of using IS and to encourage for a long time rather than productive use (Van der Heijden, 2004). The products that are mainly used due to their expected capability to evoke positive or negative emotions, independent of any utilitarian outcomes of the product usage, can be seen as hedonic products. Examples of hedonic products would be gaming consoles or music players. Additionally, a great number of products exist that do not fulfil only one purpose, but support the user in multiple ways. This study adopts an approach of revised TAM by Heijden (2004), which includes only the constructs PEOU, PU, Perceived Enjoyment (PE) and as direct impact factors on intention to use. These constructs are shown in Fig. 1.
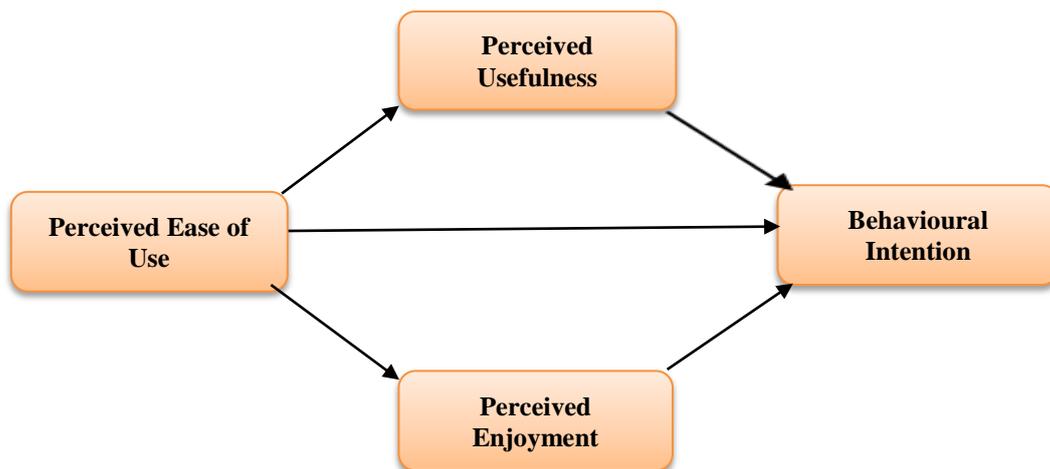

Fig. 1. Revised TAM (Van der Heijden, 2004).

3.7.1 Perceived Enjoyment (PE)

A third belief is considered by Davis et al. (1992) as an important complement to TAM which is called Perceived Enjoyment (PE). This idea is defined as the degree to which computer using activity is perceived to be pleasing in its right, without considering the performance consequences that might be estimated (Davis, et al., 1992). PE definition indicated the degree to which fun can be acquired from using the system as such. PE focuses on intrinsic motivation. In the acceptance of learning system context of the user, Lee et al. (2005) posited that the intrinsic motivation is derived from emotional feeling like pleasure, frustration or unhappiness. Thus for utilitarian systems, we can anticipate that extrinsic motivation are the central predictor of intentions to exploit the system at the cost of intrinsic motivation (Van der Heijden, 2004). As an

effect of enjoyment on technology acceptance has lack studied in the perspective of technologies related to education for school children, this relationship accounts for an important benefit of this study.

When comparing the PE for learning environment and e-book technology environment, a conclusion for developing TAM is that, the PE has a role in technology acceptance and has an impact on the future intention of use. Davis, et al. (1992) considered PE a significant additional to TAM as third belief. A few studies have been shown the relationship between PEOU and PE in TAM context applied for entertainment technologies (Van der Heijden, 2004). Heijden (2004) uses a revised version of TAM, which includes only the factors PEOU, PU and PE as direct impact factors on intention to use.

According to Wang and Huang (2015) to enjoyment, after completion of the work, most users would feel an

emotion of accomplishment. More experience minimizes chances of making errors rate, which boost user's satisfaction. Moreover, diverse content, interaction, bright colours, and an easy-to-operate interface not only delight users but also heighten users' enjoyment and experience.

3.7.2 Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)

The Perceived Usefulness (PU) is defined as the extent to which a user thinks that the performance of his or her task performance will be improved by employing a specific system. PU is the most-important factors of the computer intention. PU in TAM (Davis, 1989), TAM2 (Venkatesh and Davis, 2000) and Augmented TAM or Combined TAM and TPB called (C-TAM-TPB) (Taylor and Todd, 1995) was posited as a direct construct of BI.

While the Perceived Ease of Use (PEOU) is defined as the extent to which a user thinks, which employing a specific system would be effort free. PEOU is the second decisive factors of the computer intention. PEOU was also theorized as the direct determinant of BI in a number of theories and models including TAM, TAM2, TAM3 and C-TAM-TPB.

TAM has been applied to situations where a new technology is presented to users. It was shown to be useful when applied to different technologies (Davis, 1989). PEOU and PU dimensions have been regarded as significant in identifying the individuals' use and adoption of IT (Keil et al., 1995; Malhotra and Galletta, 1999). Lee et al. (2003) traces TAM's history, investigates its results, and carefully predicts its future track, the relationship between PU and BI is strongly significant. The previous studies posited that PU is a stronger determinant of BI. TAM theorized that PU and PEOU mediate the influence of external variables, for examples, technology characteristics, the development process and training on an intention to use. PU is also influenced PEOU as if other things are equivalent, the technology can be more beneficial if it is easy to learn it (Venkatesh and Davis, 2000).

3.7.3 Behaviour Intention (BI)

The Behavioural Intention (BI) construct is an indicator to the actual usage prediction that has been successful thus far (Ramayah and Ignatius, 2005). BI is defined by Warshaw and Davis (1985) as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behaviour". In addition, it is consistent with the TRA (Fishbein and Ajzen, 1975) and TPB (Ajzen, 1991) that assert that BI is a robust predictor of actual behaviour. Several scholars have been used successfully TAM to predict the BI towards the use of IT (Deshpande et al., 2012; Fridin and Belokopytov, 2014; Gerlach and Buxmann, 2013; Hiramatsu and Nose, 2013; Ramayah and Ignatius, 2005; Shroff et al., 2011).

3.8 Human Computer Interaction (HCI)

The Human Computer Interaction (HCI) analyses the interaction and the relationship between human and computer. HCI is more than user interfaces and more than "screen-deep" (Deep, 1997); it is a multidisciplinary field covering many areas (Helander et al., 1997).

3.8.1 HCI Definition

There are no unified or general theories for HCI that we can present. However, there is a basic principle that constitutes the foundation of HCI. However, there is a fundamental principle that forms the basis of HCI. HCI outlines three main issues of concern: the human, the computer and the tasks that are done. Therefore, the system should support the user's task that gives us a fourth focus, which is called usability. If the system is not acceptable for users then, it is not usable. There is no doubt that HCI is a multi-disciplinary subject.

3.8.2 Usability

Usability is not only ease of use but also includes efficacy that is effectiveness in terms of measures of human performance. According to Shackel (1991), the formal definition of usability of a system or equipment is "The capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfil the specified range of tasks, within the specified range of environmental scenarios". Moreover, suability is defined as the extent to which specific users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use can use the product (Standardization, 1998). Using this standard, the usability of the product can be helped thru three main quality criteria: firstly, effectiveness that relates to a measurement of how well the user is able to use the product to accomplish the aim. Secondly efficiency, which relates to the measurement of the speed of the user's task to complete it. Finally, satisfaction which is a subjective measure of how pleasant it is to use the system (Sharp et al., 2007; Standardization, 1998).

Therefore, If the users realize that a system is not ease to use (very difficult to use), the perception may influence their ability to absorb material provided by the system (Anjaneyulu et al., 1998). Moreover, from the user perspective, the usability relates to the development of interactive products which are using the product effectively, learning the product easily and enjoyable (Sharp, et al., 2007).

Usability has considered as a key issue of interface design. According to Nielsen (1994), the usability has five usability attributes:

i) Learnability: user can easily learn and rapidly use.
ii) Efficiency: user has learned the system, and a high level of productivity is possible.

iii) Memorability: user is able to return to the system after some period of not having used it, without having to relearn everything.
iv) Errors: users make few errors when using the system.
v) Satisfaction: users are subjectively satisfied during use (Nielsen, 1994).

3.8.3 Interface

The interface is a part of any interactive computer, system or application which the human comes with contact perceptually, cognitively and physically (Stephanidis, 2000). A dialog is the main interface of the interaction between the system and user. The choice of interface style has a significant effect on the dialog environment. WIMP (windows, icons, menus and pointers) menus-based interface, question/answer and query dialog, point and click, command line interface and three-dimensional interfaces are the most common interface styles that effect on the interaction (Dix et al., 2003). Sometimes WIMP stands for windows, icons, mice and pull-down menus. Nowadays, WIMP is the default interface style in use for the majority of interactive computer systems, especially in the PCs and desktop workstation. Whole WIMP systems have the same elements: windows, icons, menus, pointers, dialog boxes and buttons (Dix, et al., 2003). However, the accurate behaviour of these elements differs both within a single environment and between environments. Wang and Huang (2015) describes the users as they can enjoy, fun, aesthetic, and pleasurable interactive products through the interface of an affordable device. Interface languages applied to the user interface of mobile e-books are key factors for communication between users and products. Moreover, Wang and Huang (2015) concluded that the important elements affecting users' interface operation are aesthetics, achievement, and friendliness.

3.8.4 Child Computer Interaction (CCI)

Child Computer Interaction (CCI) is a growing discipline, which studies the children use of interactive systems. CCI is a branch of HCI (Markopoulos et al., 2008). The application of CCI principles can be found in technology-based systems related to education, sociology, art design, and storytelling. As technology influences the way people actual work, people use of technology also has an influence on technology. The impact of technology on children has been address previously in several studies (Elyazgi et al., 2014; Kucirkova et al., 2014; Ronimus et al., 2014; Roskos et al., 2014). It is becoming more crucial to study the influence of children use of technology. User interface refers to a system artefact that is designed to allow for interaction between system and the user (Phillips, 2012). The user interface depending on the domain context is characterized by the text and graphic layouts presented on a computer screen Cheon and Grant (2012).

4. The Theoretical Framework of the Study

A theoretical framework is set of theories and models that stated in the literature review (Hussey, 1997). In other words, it provides a conceptual model of how the underlying theories determine relationships among the identified factors that are important to the problem. Developing a theoretical framework will assist in the formulation of the hypotheses, testing particular relationships, and enhancement of our understanding of the dynamics of the school children learning. The mutual relations among the variables that are considered essential to the study will be discussed as part of the theoretical framework. It is also important to understand the types and meanings associated to variables. After the formulation of the theoretical framework, the testable hypotheses will be devised to examine validity of formulated theory (Sekaran, 2003).

This research studies various factors affecting e-book technology usage in schools. According to Van der Heijden (2004), the previous studies have adopted the TAM as their research framework. Van der Heijden (2004) identified a number of factors, namely, PU, PEOU, PE and BI, in TAM, which the researcher found as significant factors in explaining the use of the e-book technology for school children. Therefore, a more comprehensive theoretical model is constructed for this study by extending TAM with CCI. The proposed research model (the theoretical framework) in Fig. 2 is developed based on comprised significant types of variables such as CCI and revised TAM by Van der Heijden (2004). In this proposed model, CCI (independent variable), PE (mediator variable), PU (mediator variable), PEOU (mediator variable) and determine BI (dependent variable).

5. Methodology

In this study, all articles were selected using academic search engines like IEEE Xplore, Springer, Elsevier, EBSCO, and Blackwell, using the keywords TAM, Child Computer Interaction, e-book technology, Children, Information System Acceptance, and Human Computer Interaction (HCI). Using google scholar website, the following electronic journal databases were searched:

i. Association for Computing Machinery Digital Library (ACM)
ii. Google Scholar
iii. Science direct
iv. IGI Global
v. IEEE Xplore Digital Library
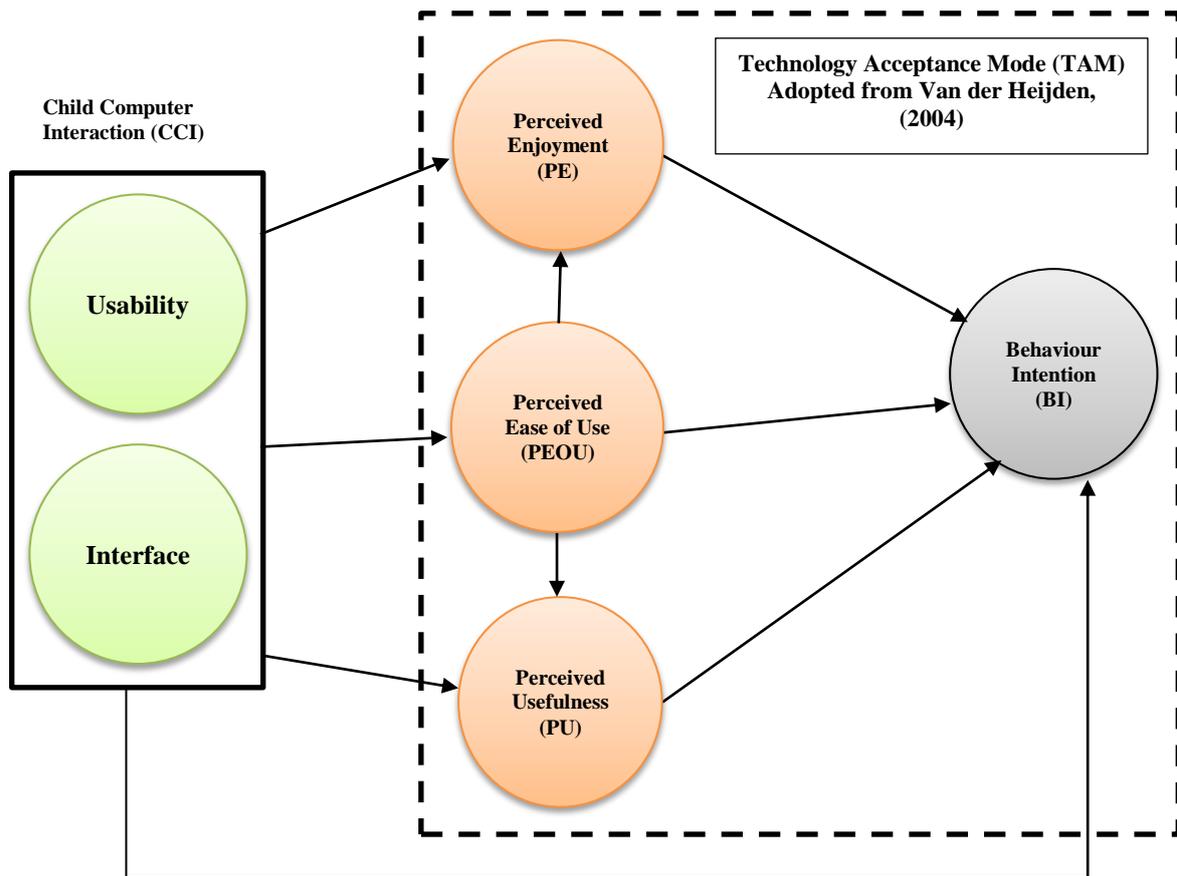vi. Springer Link
vii. Emerald
viii. JSTOR

Fig. 2. The Proposed Theoretical Framework.

6.   Discussion

As human resource development is crucial in the advancement of any nation, Malaysia places great importance on education, especially technology education (Zin, 2003). Over the past decades, several scholars especially in the area of information system have used Technology acceptance theories and models to purpose. Some of these models provided poor explanation of the observed results others were more explanatory. TAM is used in the framework. Additionally, Human-Computer Interaction was the basis of development of proposed framework too. In this study, the theories, models and HCI, and CCI, which were selected depends on striking a balanced between the degree of parsimony and the degree of explanation about the behaviour of the school children. This study is aimed at generating a model that could contribute to practical application and a prediction with an understanding about the phenomenon. In fact, beliefs reappear as significant construct in all the foremost theoretical models, which have been used to explain acceptance behaviours. Beliefs are cognitive evaluation of an individual about the outcomes of a specific behaviour. Whereas attitudes reveal an effective reply to the behaviour in question (Yang, 2004). The idea that there may be a more compound set of interactions among the beliefs prominent to technology acceptance has been joined in some recent work. Uncertainty degree of actual usage is possibly differ from idealized and planned usage. Nevertheless, the theory of acceptance allows for such deviations, as they are not significant. Dillon and Morris (1996) argue that the individual adoption process of any IS for planned purposes can be modelled and predicted. In addition to that, user acceptance is viewed as a curial factor in concluding the success or failure of any information system project (Davis, 1993).

7.   Conclusion

The literature review of theories and models in the previous sections were the basis of development of proposed framework, which is consisted by the integration of Child Computer Interaction (CCI) and Technology Acceptance Model (TAM). Hence, this would give a better understanding of the e-book technology and address issues relating to its acceptance at the schools. Thus, CCI with two factors (usability and interface) were highlighted to have significant effect on the overall acceptance decision of e-book technology. Finally, based on this study findings, it is suggested for future work to study the relationship of factors in the new proposed framework to contribute in development and motivating the trend of e-book technology innovation diffusion at schools in Malaysia.

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