Integrating Innovation Diffusion Theory and the Technology Acceptance Model: The adoption of blockchain technology from business managers’ perspective

Work in Progress

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ABSTRACT

Financial technology (FinTech) is the new business model and technology which aims to compete with traditional financial services and blockchain is one of the most famous technology uses of FinTech. Blockchain is a type of distributed, electronic database (ledger) which can hold any information (e.g. records, events, transactions) and can set rules on how this information is updated. The most well-known application of blockchain is bitcoin, which is a kind of cryptocurrencies. But it can also be used in many other financial and commercial applications. A prominent example is smart contracts, for instance as offered in Ethereum. A contract can execute a transfer when certain events happen, such as payment of a security deposit, while the correct execution is enforced by the consensus protocol. The purpose of this paper is to explore the research and application landscape of blockchain technology acceptance by following a more comprehensive approach to address blockchain technology adoption. This research is to propose a unified model integrating Innovation Diffusion Theory (IDT) model and Technology Acceptance Model (TAM) to investigate continuance intention to adopt blockchain technology.

Keywords: Financial technology (FinTech), Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), Blockchain technology,
THEORETICAL BACKGROUND

TAM was treated as a good theoretical model to explain the acceptance of new technology, however it is questionable whether the TAM model can be applied to all the cases of new technology adoption. So many empirical research recommend integrating TAM with other theories or models to cope with radical technological change and improve the quality and explanatory power (Carter & Be’langer, 2005; Legris, Ingham & Colerette, 2003). TAM and IDT are similar in some constructs and complement each other to examine the adoption of new technology (Lee, Hsieh & Hsu, 2011). Past researchers indicate that the integration of these two theories could provide a better model than either standing alone (Wu & Wang, 2005; Chen, Gillenson & Sherrell, 2002) and some prior studies prove good results of integrating the two models (Sigala, Airey, Jones & Lockwood, 2000; Gefen, 2004).

Technology Acceptance Model (TAM)

This study employs two major theoretical models—the TAM and IDT. We will begin by considering the model of TAM. Based on Ajzen and Fishbein's Theory of Reasoned Action (TRA) model, Davis introduced TAM for predicting technology usage and acceptance (Taylor & Todd, 1995; Davis, Bagozzi & Warshaw, 1989). TAM suggests that perceived usefulness (PU) and perceived ease of use (PEOU) are two primary determinants in explaining individual users’ adoption intention. While PU is defined as the degree to which a person believes that using a particular system will enhance his or her job performance, PEOU refers to the degree to which the person believes that using the system will be free of effort. The TAM has been validated repeatedly by many scholars in different settings since it was first published and so has been widely used in technology adoption research in the past decades. However, TAM is also a relatively simple model which can be modified or extended in different ways and, therefore, many extensions integrating other theories have appeared in the literature (Zhang, Guo & Chen, 2008). The model hypothesizes that technology acceptance is decided by users behavioral intention (BI) to use, Which is in turn influenced by users' attitudes (A) toward using. Finally, attitude is directly affected by beliefs about the technology, which consists of PU and PEOU. TAM is among the most influential and discussed theories in predicting and explaining end-user behavioral technology usage. It is one of the base theories for this study because of its solid theoretical foundation (Lee, Hsieh & Hsu, 2011).

Innovation Diffusion Theory (IDT)

The most well-known theory about technical innovation is IDT. Research on IDT has been widely applied in various fields such as science, sociology, communication, agriculture, marketing, internet, and technology, etc (Rogers, 1995; Karahanna, Straub & Chervany, 1999; Agarwal, Sambamurthy & Stair, 2000). An innovation is “an idea, practice, or object that is perceived as new by an individual or another unit of adoption”. On the other hand, Diffusion is “the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers, 1995). Therefore, the IDT theory argues that “potential users make decisions to adopt or reject an innovation based on beliefs that they form about the innovation” (Karahanna, Straub & Chervany, 1999). IDT theory tries to explain innovation decision process, determining factors of rate of adoption, and different categories of adopters. It helps in predicting the likelihood and rate of adoption of an innovation (Chen, Gillenson & Sherrell, 2002). IDT includes five significant innovation characteristics: compatibility(CPT), relative advantage(RAD), complexity(CPX), and trialability and observability. Relative advantage is defined as the degree to which an innovation is considered as being better than the idea it replaced. This construct is found to be one of the best predictors of the adoption of an innovation. Compatibility refers to the degree to which innovation is regarded as being consistent with the potential end-users’ existing values, prior experiences, and needs. Complexity is the end-users’ perceived level of difficulty in understanding innovations and their ease of use. Trialability refers to the degree to which innovations can be tested on a limited basis. Observability is the degree to which the results of innovations can be visible by other people. These characteristics are used to explain end-user adoption of new technologies and the decision-making process(Lee, Hsieh & Hsu, 2011). But according to prior researches of the meta-analysis of 75 diffusion articles conducted by Tomatzky and Klein, found that only relative advantage, compatibility and complexity were consistently related to adoption of technical innovations (Tornatzky & Klein, 1982).

RESEARCH MODEL

This research proposes an integrated model based on IDT and TAM models to take advantage of these two theoretical models. The two basic TAM factors are PU and PEOU and three important factors for innovation are relative advantage, compatibility and complexity (trialability and observability are omitted due to the previous analysis of Tomatzky and Klein), which are included as the major determinants in our integrated framework of the new technology adoption (see Fig.1). This model will better reveal how these different factors influence business managers’ acceptance intentions and usage behavior of blockchain technology adoption process in FinTech industry. The validity and applicability of the proposed model will be tested based on the following hypotheses.

TAM Model Hypotheses

The proposed research model adopts TAM belief—attitude—intention—behavior relationship. These relationships can stated in the following hypotheses.

H1: users’ behavioral intention (BI) had a positive effect on his or her actual use the blockchain technology.
H2: users’ attitude toward using (A) had a positive effect on his or her BI to use the blockchain technology.
H3: users’ perceived usefulness (PU) had a positive effect on his or her BI to use the blockchain technology.
H4: users’ perceived usefulness (PU) had a positive effect on his or her attitude toward using (A) the blockchain technology.
H5: users’ perceived ease of use (PEOU) had a positive effect on his or her attitude toward using (A) the blockchain technology.

**IDT Model Hypotheses – Compatibility (CPT)**

Agarwal and Prasad asserted a positive relationship between user’s previous compatible experiences and the new technology adoption (1999). They found that the extent of past experience with similar technologies was positively associated with an ease of use belief about the new technology innovation. Moreover, Chau and Hu reported that the effect of compatibility was found to be significant only in relation to PU (2001). Later, Wu and Wang (2005) and Chang and Tung (2008) confirmed that compatibility had a significant positive and direct effect on PU and the behavioral intention. Likewise, previous studies have investigated compatibility from different aspects, resulting in support for its impact on PU, PEOU and intention to use (Hardgrave et al., 2003). Based upon the preceding research, the following hypotheses were proposed:

**H6:** Compatibility had a positive effect on PU of the blockchain technology.

**H7:** Compatibility had a positive effect on PEOU of the blockchain technology.

**IDT Model Hypotheses – Relative advantages (RAD)**

Research consistently found that the perceived relative advantages positively affected the users’ intention to use the system across different participants (Shih, 2007; Lee, 2007). However, in TAM and IDT research, the relationships among relative advantages, PU, and PEOU had seldom been studied with the only one study revealed that when the users perceived higher relative advantages, they perceived a higher level of usefulness of the technology. Accordingly, we hypothesized:

**H8:** The relative advantages had a positive effect on PU of the blockchain technology.

**H9:** The relative advantages had a positive effect on PEOU of the blockchain technology.

**IDT Model Hypotheses – Complexity (CPX)**

The previous empirical studies provided evidence indicating that complexity had a significantly negative effect on the intention to use technology (Shih, 2007; Lee, 2007). On top of that, a negative relationship between complexity and PU was also revealed in a study conducted by Hardgrave, et al. (2003). Thus, based on the preceding researches, we proposed the hypotheses as below:

**H10:** Complexity negatively affected PU of the blockchain technology.

**H11:** Complexity negatively affected PEOU of the blockchain technology.

In conclusion, the proposed structure of the IDT-TAM integrated model is represented by H1-H11 as shown in Figure 1.

![Proposed research model](image)

**Figure 1: Proposed research model.**

**FUTURE RESEARCH**

This research will send a survey via e-mail or social network that directed users to a web-based questionnaire to collect data for quantitative testing of the proposed model and the survey regarding the recognition and adoption of blockchain technology among business managers. Because it is difficult to execute a random sampling for all the users using blockchain technology in Taiwan. Thus, in this research we will adopt a non-random sampling technique to collect the sample data. Additionally, because the new blockchain technology is a data-scare domains and in order to generalize results, we will gather sample data from any kinds of blockchain technology using industries, including all private companies and government agencies but not limited to financial institutes in Taiwan. The questions utilized in the questionnaire to operationalize the TAM and IDT constructs included in the proposed model will adapt from the previous research (Moore & Benbasat, 1991; Davis, 1989). All the questions will be translated into Chinese and adjusted in wording in view of the characteristics of the blockchain technology for easy understanding. Most of the items were measured using a five point Likert-type scale, ranging from “strongly disagree” (1) to “strongly agree” (5). The questionnaire will be developed and divided into three parts. The first part of the questionnaire will be to collect the users’ basic demographic data, such as age, gender, annual income, educational level,
work experience, prior experience using new technology, etc. The second part of the questionnaire was based on the constructs of PU, PEOU, BI, USE in the TAM model and was adapted from the measurement defined by Davis et al. and Venkatesh & Davis (Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 2000). The third part of the questionnaire was based on IDT including compatibility (CPT), complexity (CPX), relative advantages (RAD), observability (OB), and trialability (TRI). The above items were adapted from the previous studies (Taylor & Todd, 1995; Davis, Bagozzi & Warshaw, 1989; Moore & Benbasat, 1991; Karahanna, Straub & Chervany, 1999).

REFERENCES