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A Unified Transaction Cost Model for Adoption of Payment Technologies

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Abstract

This study attempts to develop an integrated model for the adoption of payment technologies. A total of 67 papers on research on payment technology adoption were examined. A unified transaction cost model for adoption of payment technologies is proposed and discussed by integrating Transaction Cost Economics Theory (TCE) and Expectation Confirmation Theory (ECT). Hypotheses are proposed and method is discussed.

Keywords

Payment technology, adoption, transaction cost, expectation confirmation theory.

Introduction

As the payment technologies continuously advance, consumers have many different payment options available to them. It is imperative to study how consumers adopt payment technology, especially emerging ones such as cryptocurrency. A review of prior research on payment technology adoption presented in Table 1 suggests that researchers have attempted to use different theories in their studies such as the technology acceptance model (TAM), diffusion of innovation theory (DOI), and unified theory of acceptance and use of technology model(UTAUT), etc. The findings from past research tend to be fragmented and lack of consensus. Also, the role of users' assessment of the overall adoption's cost based on users' unique situations has not been explored. It is clear that there is a research gap in this regard.

The primary objective of this study is to develop an integrated model on payment technology adoption with a holistic view that captures most of the previously identified factors affecting payment technologies adoption to understand the aggregated cost related to the adoption. To achieve this objective, Transaction Cost Economics Theory (TCE) and Expectation Confirmation Theory (ECT) are combined with a fresh perspective that focuses on users' perspective of the total cost associated with the technology. The following sections will elaborate on the literature review process, the theoretical framework, and the method.

Literature Review

Adoption of Payment Technologies

A thorough literature review was conducted to understand what has been accomplished regarding the adoption of payment technologies. During this process, databases like ABI/INFORM, ACM, IEEE, and Google Scholar were searched. In total, 67 papers were found from both traditional business and information systems literature. These papers investigated a wide variety of payment technologies such as cash, checks, credit & debit cards, mobile payment, online payment, and cryptocurrency. These papers were published between 1971 and 2020. Table 1 presents a summary of this literature review.

Some observations are made among the 67 papers we reviewed: 1) Many studies adopted a theory or model with constructs lacking specificity (i.e. PU construct in TAM). 2) Most research findings tend to be fragmented and incomplete. It is often that findings from one study cannot explain all of the constructs discovered in other research. The goal of this study is to fill this research gap and to develop an integrated model for the adoption of payment technologies with a holistic view.

# of Papers	Technology	Theory	Citations	Attributes Impacting Adoption
15	Traditional Payment Systems. Cash, credit and debit cards.	No models. Just salient attributes related to payment methods.	Plummer (1971); Hirschman and Goldstucker (1978); Hirschman (1982); Stavins (2001, 2018); Borzekowski, Jonker (2007); Kiser and Ahmad (2008); Rysman (2009); Schuh and Stavins (2011); Huynh, Schmidt-Dengler and Stix (2014); Yang and Ching (2014); Huynh and Sabetti (2015); Arango, Trutsch (2016); Koulayev, Rysman, Schuh (2016); Wakamori and Welte (2017).	Demographics; Transaction speed; Security ; Cost; Set-up ; Acceptance; Rewards; Record-keeping
29	Mobile Payment	Technology Acceptance Model (TAM)	Zhang, Yue and Kong (2011); Augsburg (2014); Cabanillas et al. (2014); Zhou (2014); Liébana-Pham and Ho (2015); Pietro et al. (2015); Madan and Yadav (2016); Phonthanukitithaworn, Sellitto and Fong (2016); Bailey et al. (2017); Mun, Khalid and Nadarajah (2017); Wulandari (2017); Liébana-Cabanillas, Munozo-Leiva, Sanchez-Fernandez (2018); Su, Wang and Yan (2018);	Perceived usefulness (PU); Compatibility Perceived ease of use (PEOU); Convenience; Behavioral Intention.
		Unified Theory of Acceptance and Use of Technology (UTAUT)	Schierz, Schilke and Wirtz (2010); Pietro et al. (2015); Qasim (2015); Teo (2015); Oliveira et al. (2016); Abidin et al. (2017); Cash (2017); Fitriani and Suzianti (2017); Megadewandanu, Suyoto and Pranowo (2017); Raza (2018);	PU ; Perceived security; Compatibility; Subjective norm; Individual mobility.
		Diffusion of Innovation (DOI)	Pham and Ho (2015); Pietro et al. (2015); Phonthanukitithaworn, Sellitto and Fong (2016);	Relative advantage; Compatibility; Complexity.
		Perceived risk theory	Huang (2012); Yang et al. (2014); Park (2018);	Perceived Risk.
		Prospect theory (PT)	Yang et al. (2014)	Perceived uncertainty.
13	Online Payment	TAM	Jaw, Yu and Gehrt (2011); Lin and Nguyen (2011); Barkhordari et al. (2017); Riskinanto, Kelana and Hilmawan (2017). Salloum and Al-Emran (2019); Ardiansah et al. (2020);	PU; PEOU; Compatibility; Age.
		Perceived risk theory	Özkan, Bindusara, and Hackney (2010); Rouibah, Lowry and Hwang (2016); Oney, Guven and Rizvi (2017); Nguyen and Huynh (2018);	Perceived security; Perceived trust.
		UTAUT	Gholami et al. (2010); Junadi and Sfenrianto (2015); Shafie et al (2018);	Perceived benefits; Effort expectancy;
		Valence Framework	Pei et al (2015).	Perceived benefit; Perceived trust
10	Crypto-currency	Theory of Planned Behavior	Walton and Johnston (2018); Mazambani and Mutambara (2019); Yoo et al. (2019);	Attitude; Perceived behavioral control.
		DOI	Abramova and Bohme (2016); Wood et al. (2017); Yoo et al. (2019);	Perceived benefits; Relative Advantage.
		NA	Schuh and Shy (2015)	Demographics
		UTAUT	Hutchison (2017); Arias-Oliva, Pelegrín-Borondo, and Matías-Clavero (2019);	Performance and Effort expectancy.
		TAM	Bühler, Bick and Bonorden (2015); Abramova and Bohme (2016); Wood et al. (2017); Walton and Johnston (2018);	PEOU PU

Table 1. Summary of Payment Technology Adoption Literature [1]

Transaction Cost Economics (TCE)

Transaction Cost Economics (TCE) is a theoretical framework for predicting when certain economic tasks would be performed by firms (Williamson 1979, 2005). According to Williamson, the determinants of transaction costs are frequency, specificity, uncertainty, limited rationality, and opportunistic behavior.

We argue that transaction cost is a driving factor for consumers to determine which payment technology to adopt. Taking into account that the relationship between users and payment technologies' providers is a sort of transaction, users consider the transaction costs involved in this bilateral exchange to form a decision about whether this channel (payment technology) has the lowest cost or not. Making a payment itself is not for fun only and it must have some utilitarian values. For a utilitarian task, the main differentiating factor is the cost when determining how to do it. The Transaction Cost Economics theory provides a theoretical framework to identify potential factors impacting on transaction costs and then adoption.

Expectation Confirmation Theory (ECT)

Expectation confirmation theory (ECT) explains post-purchase or post-adoption satisfaction as a function of expectations, perceived performance, and disconfirmation of beliefs(Oliver 1976, 1980). In this study, we are relying on the theoretical grounds of ECT while adjusting some constructs to fit our context. The focus is on determining the total perceived transaction cost of using payment technologies, so users will form their expectations regarding the cost associated with the usage of the technology.

Research Model & Hypotheses Development

Based on TCE, and ECT theories, a unified transaction cost model is proposed for the adoption of payment technologies (Figure 1). In this model, we define cost expectations as to how much consumers are willing to spend on a payment technology based on the information they have from various sources. The expectation is then compared with the perceived total transaction cost associated with the use of payment technology. The difference between cost expectation and total transaction cost leads to perceived affordability which will have a positive impact on the intention to adopt.

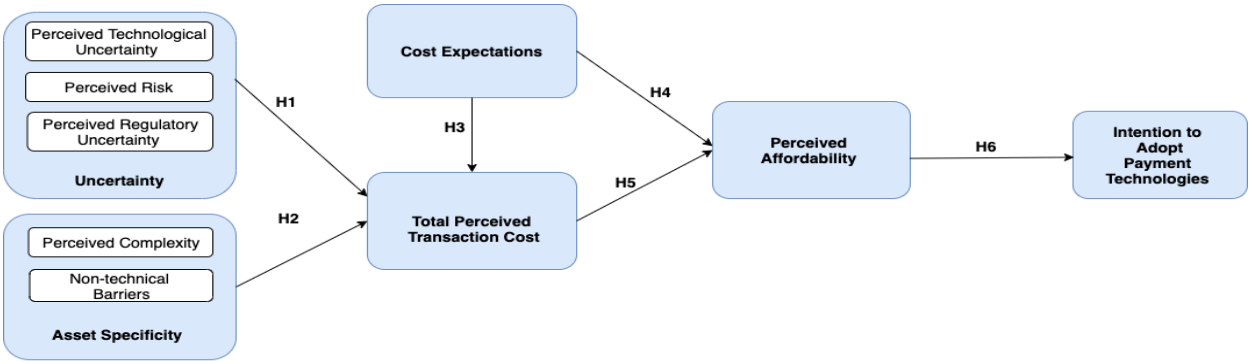

Figure 1. A Unified Transaction Cost Model for Adoption of Payment Technologies

Uncertainty

As a determinant of transaction cost, Williamson (1985) states that uncertainty arises from imperfect foresight and human inability to solve complex problems associated with transactions, which can be regarded as the cost associated with the unexpected outcomes and asymmetry of information. The sub-constructs for uncertainty related to transaction cost are identified as:

1- *Perceived technological uncertainty:* it refers to the unpredictability of technological development, the turbulent technological environment, and uncertainty about the functions and consequences of the technology (Song 2001). It is been argued that users' perceptions of technological uncertainty might

[1] List of papers can be provided upon request.

influence their purchase behavior about products and services, especially for high-tech products such as having concerns about the performance (Yang et al. 2015).

2- *Perceived risk:* one of the most factors associated with the use of a payment technology (Arias-Oliva et al. 2019). The risk can be financial or non-financial such as risks related to social, security, trust and privacy matters (Featherman and Pavlou 2003). Hence, factors such as social image and subjective norms have been used to determine consumers' choices in accepting new technology. So, we define perceived risk as users' perception of the all possible negative consequences associated with the use of payment technologies

3- *Perceived regulatory uncertainty:* it is defined as users' perceptions of the instability and uncertainties of the regulatory environment of payment technologies. It is found that a firm's perceived regulatory uncertainty significantly influences management decision making (Engau and Hoffmann 2009). Researchers have proved that it affects the adoption of mobile payment (Yang et al. 2015). Thus, we hypothesize that:

H1: Uncertainty has a positive impact on the total perceived transaction cost.

Asset Specificity

Williamson (1979) states that asset specificity takes many forms such as physical assets, a monetary asset, a body of knowledge, a personal relationship, a certain skill and so on. In the current study, asset specificity is defined as the barriers (technical and non-technical) for a consumer to adopt a payment technology. Asset specificity has been used to explain how first mobile payment adopters spend time and effort learning how to use and install the required software (Gao and Waechter 2017). Thus, asset specificity represents users' belief that payment technologies are difficult to learn and are associated with many barriers.

1. *Perceived complexity:* it is defined as the degree to which a payment technology is difficult to understand and use (Rogers, 1983). This construct and its effects have been extensively investigated under different labels such as perceived ease of use, usability, perceived compatibility, perceived trialability, etc. (Hillman et al. 2014; Qasim and Abu-Shanab 2016).
2. *Non-technical barriers:* we argue that users might have to overcome some non-technical barriers such as certain income levels to have access to a certain payment technology (Schuh and Stavins 2015). This is one important construct that many models such as TAM have missed. We hypothesize that:

H2: Asset specificity has a positive effect on the total perceived transaction cost.

Cost Expectation

Drawing from the ECT, users might develop a cost expectation of a payment technology based on the information they acquire from different sources. This expectation will help them form an initial perception of the total transaction cost of this payment technology. Users' cost expectation can be impacted by factors such as perceived additional value, the attractiveness of alternatives, perceived usefulness, and perceived service quality. For example, users may be willing to pay a higher cost if they believe certain payment technology is better than others. So, users would have some beliefs/assumption1s about payment technology affordability that can be compared with the perceived total transaction costs, which then will be used to confirm or not these beliefs through the perceived affordability construct that is discussed later.

Total Perceived Transaction Cost

The basic principle of TCE is that people prefer to conduct a transaction in a way that minimizes their transaction costs. We define the total perceived transaction cost as a user's perception of the aggregated overall cost (tangible and intangible) associated with the use of payment technology. We hypothesize that:

H3: Cost expectation has a negative effect on the total perceived transaction cost.

H4: Cost expectation has a positive effect on the perceived affordability.

H5: Total perceived transaction cost has a negative effect on the perceived affordability.

Perceived Affordability

Perceived affordability is the difference between cost expectation and total perceived transaction cost. A cost expectation higher than total perceived transaction cost leads to positive perceived affordability. It is posited that the higher the level of perceived affordability, the higher the level of behavioral intention to adopt a payment technology. Studies have shown that affordability explains the adoption of several technologies such as high-speed broadband, e-government services, e-commerce, and e-Business technology in SMEs (Alshehri and Drew 2010; Wresch and Fraser 2011). We hypothesize that:

H6: Perceived affordability has a positive effect on the intention to adopt payment technology.

Research Methodology & Next Step

A questionnaire will be developed to measure the constructs using items from prior research. An online survey will be conducted and announced through public emails and social media to collect and analyze data using confirmatory factor analysis (CFA) in conjunction with structural equation modeling (SEM).

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