Factors Influencing the Use of Mobile Payments – A Conceptual Model

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***Abstract*— The hype around mobile payments has been growing in Sri Lanka with the exponential growth of the mobile adoption and increasing connectivity to the Internet. Mobile payments offer advantages in comparison to other payment modes, benefiting both the consumer and the society at large. Drawing upon the traditional technology adoption theories, this research develops a conceptual framework to uncover the influential factors fundamental to the mobile payment usage.**

The phenomenon discussed in this research is the factors influencing the use of mobile payments. In relation to the topic, nine independent factors were selected and their influence is to be tested onto behavioral intention to use mobile payments. The questionnaires need to be handed out for data collection for correlation analyses to track the relationship between the nine independent variables and the dependent variable – behavioral intention to use mobile payments. The second correlation analysis between behavioral intention to mobile payments and mobile payment usage is also to be checked together with the two moderating variables – age and level of education.

Keywords*— *mobile payments; economic theory; modernization theory; diffusion of innovation model; theory reasoned action (TRA) model; technology acceptance model (TAM); Unified theory on acceptance and use of Technology (UTAUT) model.

I. INTRODUCTION

Digitation and automation of businesses and financial services together with the rapid penetration of mobile telephony is citied as the most profound development during the past two decades [1]. By neutralizing barriers of time and location, the mobile payment platforms empower consumers to access their banking services in a frictionless manner without the need for ever visiting a physical outlet of a bank.

Mobile payments or mobile money refers to the payments made via a mobile device. The current hype in mobile payments is due to the growth of the Internet, advancement of wireless/ contact-less communications, and proliferation of mobile devices [2]. Mobile commerce or m-commerce is cited as one of the key elements of the modern society, thus how payments are made remains a core component in this m-commerce eco-systems determining modern organization's survival [3]. It has also been argued that financial payment system improvements in developing countries can greatly contribute to the economic development [4], and in some cases this could amount up to 7% of the GDP [5].

Sri Lankan government spends 1.5% GDP for up-keeping the physical currency notes [6]. In addition, mobile money is also beneficial in creating new opportunities for rural economies, thus enabling financial services to be extended to unbanked people at a significantly lower cost while addressing financial inclusivity. Hence, a well-built mobile payment platform can create an avalanche effect across the entire financial value chain while creating more employment opportunities. On the other hand, Sri Lanka would also want to avoid a situation where mobile payment adoption remains low, despite having a very high mobile penetration, a situation which materialized in Thailand [7].

II. LITRETURE REVIEW

Number of theories have been applied to understand and predict the information technology usage by researchers. Among these, the most prominent theories include Economic theory, Modernization theory, Diffusion of Innovation Model, Theory Reasoned Action Model, Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology Model. These theories are discussed in the next section.

A. Economic Theory

During the 1950s, Milton Friedman, a professor at the University of Chicago promoted free market capitalism over government regulation, thus opposing the traditional Keynesian approach. Influenced by early free market thinkers such as Friedrich von Hayek, Milton Friedman advocated governments to stay away from individuals' affairs, and that the markets can solve economic problems efficiently than governments can, giving birth to the Chicago School of Economics – a concept of free market Monetarism [8]. Friedrich von Hayek believed that the free markets and the political liberty to be heavily coupled [9]. Free market thinkers like Friedman's and Von Hayek's work paved the way to privatization and deregulation.

Knowledge is considered as a core component in new economic theories due to the productivity enhancements introduced by investments in knowledge [10]. Scholars [11] have highlighted the importance of knowledge based economies and how those economies are leveraging on new information infrastructure for their competitive advantage [12, 13].

B. Modernization Theory

How the societies progressed from "traditional" to "modern" can be explained via the Modernization theory.

Traditional societies can be transformed into modern societies with the process of social evolution by adopting modern practices [14]. Modernity can be explained by attributes such as development of an advanced industrial sector, the breakdown of peasant economies, the spread of wage labor, urbanization, the pace of economic development, the capacity of countries to generate savings, and the emergence of more open and democratic forms of rule [15]. Traditional societies are believed to be stagnant and static, with more focus on spiritual values instead of focusing much on the individual betterment [16]. Modernization theory is considered as the prevailing principle among social scientists in developed countries to understand the roots of under-development and poverty in developing economies [16].

Isbister believed that poverty still exists due to the decisions made by world leaders and the policy decisions they have implemented [16]. However, he further iterated that rich nations are not directly responsible for the predicament of the poor nations. He was of the opinion that this was due to lack of democratic institutions, scarcity of financial capital, usage of old fashioned, non-effective technology and lack of ingenuity. As positives of traditional way of life, Isbister highlighted more reliance on family with no or minimal estrangement or alienation. Poor countries could transform themselves by learning from the mistakes made by rich European nations, by getting assistance on modern cutting-edge technology and by infusion of financial capital. In order for development to occur what is needed is better policies and planning, new technology, more capitol; and not revolutionary changes in political or economic relationships [16].

A World Bank sponsored research [17] has pointed out that economic growth in Sri Lanka is mostly restricted to certain geographic areas. In order to address such shortcomings, it is essential to build the necessary infrastructure (such as roads, rail roads, harbors and airports) and also the Information Communication Technology infrastructure [18]. Further, a number of previous scholars [19, 20] have highlighted the positive correlation between economic freedom and economic growth. It is also believed that developed and successful economies have enhanced and advanced technologies and they are prepared to use the same for competitive advantage [21].

C. Diffusion of Innovation Model

The motives behind adoption of new technologies and innovations have been a heavily researched theme under various disciplines such as education, history, political science, communications, economics and technology [22, 23].

Rogers [23] used "technology" and "innovation" as synonyms in his book titled Diffusion of Innovations and he described technology as a "design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome". Diffusion is defined as the process in which innovations are communicated over different channels across a social eco-system. The diffusion itself is about a novel idea entailing certain degree of uncertainty.

An innovation is described as a project, practice or an idea perceived by an individual or a society of adaptation of new technology [23]. Roger's model describes five stages of how an innovation in spread via the communication channels among the members of a society over time.

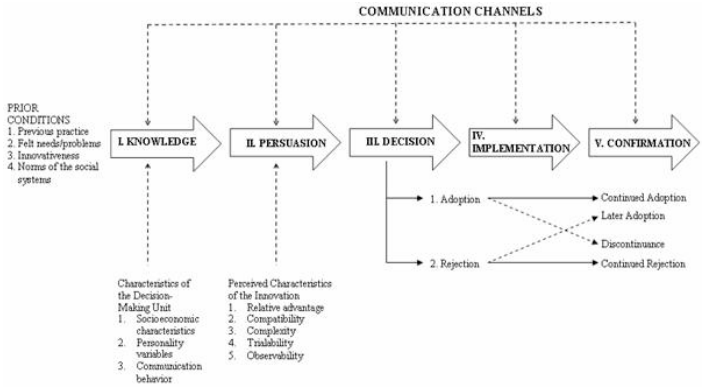

Figure 2.1: Stages of Innovation Decision Process [23]

Individuals or societies go through different stages of Knowledge, Persuasion, Decision, Implementation and Confirmation (as shown above) at the decision making stage of adopting or rejecting an innovation or a technology.

With the growth of the Internet and other associated eco systems such as payment platforms, researchers have carried out diffusion studies on these technologies [24, 25, 26, 27, 28].

One criticism against the diffusion model has been its pro-innovation biasness. Diffusion theorists believe that the innovations should be adopted by all members of a social system or society, in a quick time frame and that such innovations should not be rejected or re-invented [23].

D. Theory Reasoned Action Model

The Theory Reasoned Action (TRA) model has its roots in psychology and it attempts to elaborate and predict the user's behavioral intentions based on 'attitudes' and 'subjective norms' [29]. Attitudes are described as sum of beliefs attributed to a particular behavior. Thus it could vary depending on the attributions and beliefs while subjective norms are described as mostly situational consisting of user's opinion about the subject's behavior which could be influenced by a variety of factors such as economy, politics, society and other demographic variables [30]. The behavioral intention of a user is described as a user's ability to carry out an intended behavior.

Figure 2.2: Theory Reasoned Action [30]

As depicted in figure 2.2, the formula for the Theory Reasoned Action model can be summarized with the equation below.

$$BI = W1(A) + W2(SN) \quad (1)$$

Where BI represents the behavioral intention of a user as depicted above in (1), the behavioral intention is expressed as a function of user's attitude (A) towards performing the behavior and subjective norm (SN), and W1 and W2 represent empirically derived weights, an attitude towards performing a specific behavior can be mathematically modeled in the following form [31].

$$A_B = \sum b_i e_i, \quad (2)$$

A_B represents the user's attitude towards a specific behavior and that attitude is the sum of belief strength b_i and belief evaluation e_j as illustrated in (2). Further, the subjective norm can be mathematically expressed as follows [31].

$$SN = \sum b_j m_j, \quad (3)$$

As listed above in (3), b_i represents the normative belief and m_j represents the user's motivation to comply with the normative belief. The Theory Reasoned has been developed to deal with behaviors (e.g. shopping for a new vehicle) as opposed to outcomes (e.g. owning a new vehicle) which arises as a result of a behavior [32]. Hence, when performing certain actions that require special skills or expertise, the pre- conditions of the theory reasoned action cannot be met [33].
Therefore, the theory reasoned action model may struggle covering scenarios with IT usage. In order to address these inadequacies, Fishbein & Azjen [30] have suggested to identify applicable beliefs in advance using a free response questionnaire covering the survey population. However, this would be time consuming, and a sampling error could also occur due to the inability to identify significant beliefs among the population.

Further, the TRA model is not able to explain behaviors which are spontaneous, impulsive or habitual, or those resulting due to cravings. This is due to the fact that these behaviors occur without involving a conscious decision on the part of the actor [34]. The Theory of Planned Behavior (TPB) was developed in order predict the behaviors where users have partial volitional control [35]. The TPB includes a third determinant of behavioral intention – Perceived Behavioral Control.

E. Technology Acceptance Model

One of the most widely used models for explaining technology adoption and usage is the Technology Acceptance model (TAM) [36] [37] [38] [39]. TAM is a variation of TRA model [36].

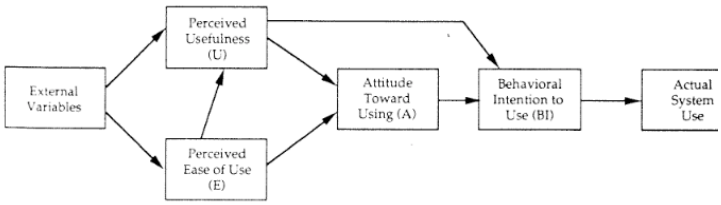

Figure 2.3: Technology Acceptance Model [36]

The Technology acceptance model can be utilized for predicting whether a new technology platform will be acceptable or not with an explanation among a user base [36]. As illustrated in figure 2.3, there are three major constructs in TAM: Perceived Usefulness, Perceived Ease of Use and Attitude towards Using. Perceived usefulness is defined as the degree to which an individual considers that using a specific technology will enhance his or her job performance while perceived ease of use is defined as the degree to which a person has confidence in the fact that using a particular technology will be free of effort [36]. Attitude towards Using is defined as a user's perception about the system's usefulness and ease of use, which results in behavioral intention to use the system or not to use the system [36].

However, the Original TAM model may not be able to predict the behavior of inexperienced users or whether the determinants of IT usage are the same for both experienced and inexperienced users of the system. Taylor and Todd [40] proposed an augmented TAM model for Information Technology usage addressing both experienced and inexperienced users. They concluded that inexperienced users tend to underestimate the cost, without focusing on perceived usefulness of using an IT system. As suggested by Davis [41], the future researches on Information system usage needs to address other variables that impact usefulness, user acceptance and ease of use. Researchers have extended the TAM by adding new constructs such as perceived credibility [42] [43], perceived financial cost [44], perceived self-efficacy [45] [46] and perceived enjoyment [47].

F. Technology Acceptance Model 2

Technology Acceptance Model 2 or TAM 2 was developed on top of the existing Technology Acceptance model. The TAM 2 includes the subjective norm as an antecedent of perceived usefulness and as a predictor of behavioral intention [48]. The TAM 2 also includes four cognitive processes – job relevance, output quality, result demonstrability, perceived ease of use and three social forces – subjective norm, experience and voluntariness. Notably, the TAM 2 omits the behavioral intention to use a variable which is present in the original TAM (figure 2.3). The subjective norm is defined as "the person's perception that most people who are important to him think he should or should not perform the behavior in question" [48]. TAM 2 also proposes experience and voluntariness as moderating variables between subjective norm and behavioral intention as depicted in figure 2.4.

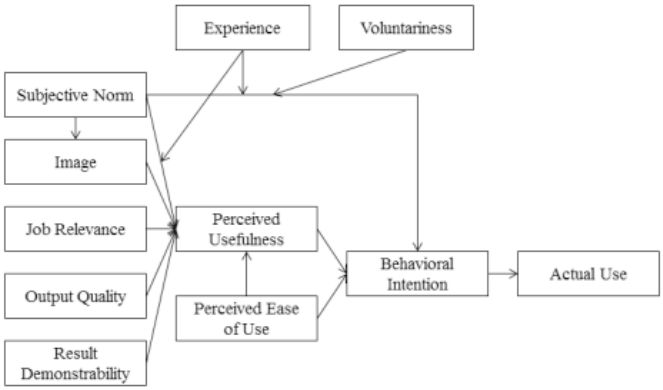

Figure 2.4: The Technology Acceptance Model 2 [48]

Venkatesh & Davis [48] believe that people may depend on other people's opinion or subjective norms when they are at the initial stage of getting used to a new IT system, and once they gather more experience, the influence of the relevant individual will decrease. Image is defined as "the extent to which a person believes the technology enhances one's status in the organization".

G. Unified Theory on Acceptance and Use of Technology Model

Unified theory on acceptance and use of Technology (UTAUT) was formulated by Venkatesh et al [49]. The UTAUT model consists of four main independent variables – performance expectancy, effort expectancy, social influence and facilitating conditions.

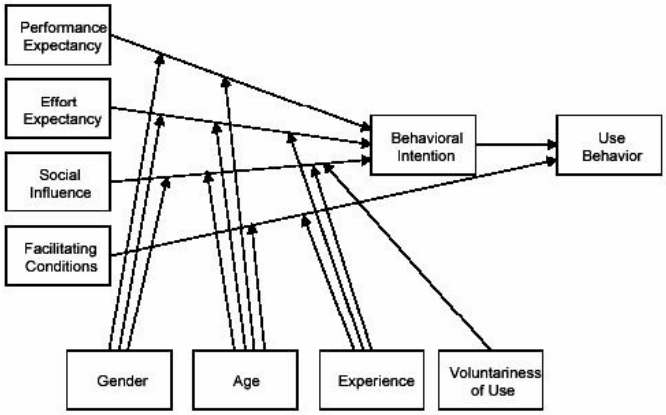

Figure 2.5: Unified Theory on Acceptance and Use of Technology Model [49].

As shown in the figure 2.5, behavioral intention and use behavior are treated as the dependent variables while, gender, age, experience and voluntariness of use are considered as factors that directly influence the relationship between the dependent variables and the independent variables.

The UTAUT model provides an extended and unified view of user acceptance of information systems and subsequent usage behavior. Further, the UTAUT is more comprehensive as it encapsulates eight other research models predicting IT usage behavior [50]. However, UTAUT model is also criticized for having many citations without actually using it [50] [51].

III. CONCEPTUAL FRAMEWORK

Based on the literature review, the proposed conceptual model and the hypothesis for this research are illustrated below.

A. Perceived Risk

Perceived risk is defined as the nature and the amount of risk perceived by a consumer while contemplating a buying decision [52]. If the perceived risk is considered to be high, the consumer may decide not to proceed with the mobile payment and may switch back to a traditional mode of purchase. However, if the perceived risk is considered to be low, the tendency to make a mobile payment by the consumer may increase. Perceived risks could occur due to failures in the supporting technology platform or due to human intervention.

"Is my credit card information safe?", "Is the product quality the same as what I see on the screen?", "Will I understand how to order and return the merchandise if the need arises", "What if the product is not delivered?" are the mostly cited risks or uncertainties in a digital platform [53]. Yates and Stone [54] have defined the notion of risk and uncertainty using the following three elements: the potential loss, the significance of the loss and the uncertainty of the loss. Hausmann and Williams [55] have identified 30 different risk elements, segregated under 5 headings technical, human, content, compliance and reputational.

H1: There is a relationship between Perceived Risk and Behavioral Intention to Use Mobile payments

B. Perceived Cost

Perceived cost is defined as the overall expenses associated with the adoptionof the particular technology platform [56].

In an empirical survey conducted among over 200 students Genlin and Jie [57] suggest that the cost has a negative correlation with experience value and the intention to adopt.,. Researchers were of the opinion that the students are not sensitive to the prices, but rather more concerned about the practical value and entertainment brought by the technologies.

Cudjoe et al [58] in an empirical research conducted in Ghana on determinants of mobile banking adoption have shown that perceived financial cost has a strong correlation between the intention to adopt and the use of mobile banking services. The result has shown that the costs associated with mobile banking have a negative effect on intention to adopt and use of mobile banking

H2: There is a relationship between Perceived Cost and Behavioral Intention to Use Mobile payments

C. *Perceived Advantage*

Perceived advantage is defined as the degree to which an innovation is perceived better than the ideas it supersedes [23]. Singh et al [59] state that the time critical consumers consider always on functionality as the pivotal feature which attracts them to consume mobile banking.

Previous researchers also suggest that mobile payments offer consumers additional advantages in relation to location free access [60], ubiquitous purchase possibilities such as timely access to financial information and ability to pay for services remotely [61].

H3: There is a relationship between Perceived Advantage and Behavioral Intention to Use Mobile payments

D. *Perceived Ease of Use*

Perceived ease of use is defined as the degree to which a user has confidence in the fact that a particular technology will be free of effort [36].

Asfour & Haddad [62] in an empirical research conducted in Jordan to determine the impact of Mobile Banking on Enhancing Customers' E-Satisfaction have identified that ease of navigation was positively correlated with the customers' e-satisfaction. The researchers have further elaborated that the ease of navigation would increase the customers' convenience, and would thus encourage more usage and ensure better satisfaction.

Fathima and Muthumani [63] in an empirical research conducted in India to determine the factors influencing the Internet Banking acceptance have found that perceived ease of use played a predominant role in deciding Internet banking acceptance.

H4: There is a relationship between Perceived Ease of Use and Behavioral Intention to Use Mobile payments

E. *Perceived Usefulness*

Perceived usefulness is defined as the degree to which an individual considers that using a specific technology will enhance his or her job performance [36].

Shanmugam et al [64], have conducted an empirical research among participants in three universities in Malaysia to determine the antecedents of behavioral intention to use mobile banking. They have found out that perceived usefulness has had a positive effect on behavioral intention to use mobile banking. They have further found that perceived usefulness is positively correlated with attitude towards using mobile banking.

H5: There is a relationship between Perceived Usefulness and Behavioral Intention to Use Mobile payments

F. *Perceived Behavioral Control*

Perceived behavioral control refers to the individual user's perception of his or her ability to demonstrate a given behavior [65]. Hence, perceived behavioral control of a consumer who intends to use mobile payments would depend on his or her perception of how easy or difficult conducting transactions over the said platform would be.

Early research by many scholars [66, 67, 40, 68 and 69] have suggested that perceived behavioral control plays a prominent role on new IT system adoption. Further, there are a number of studies [70, 71, 72] suggesting a strong correlation between perceived behavioral control and actual behavior.

H6: There is a relationship between Perceived Behavioral Control and Behavioral Intention to Use Mobile payments

G. *Social Influence*

Social influence is defined as the degree to which an individual perceives that others believe he or she should use the new system [49]. The strong correlation between social influence and mobile payment adoption has been highlighted by many scholars [73, 74, 75, 76].

H7: There is a relationship between Social Influence and Behavioral Intention to Use Mobile payments

H. *Credibility*

Credibility is applicable to all the partners involved in the mobile payment ecosystem. In recent times, many financial organizations such as banks are trying to be more virtual using remote access technologies and Internet infrastructure. Thus consumers are losing the direct relationship/ interactions they have had with bank employees. This new and previously unfamiliar experience could cause uncertainty among consumers [77].

A research conducted in China has suggested credibility as a key factor in mobile adoption. The researcher further points out that the mobile payment market is slowing down in China due to lack of credibility in the parties developing the supporting infrastructure. The strong correlation between credibility and mobile payment adoption has been shown by previous studies [78, 79, 80].

H8: There is a relationship between Credibility and Behavioral Intention to Use Mobile payments

I. *Compatibility*

Compatibility is the level to which the innovation is matched to an individual's life style [81]. Hence, if the mobile payment platform is more compatible, it will reduce the need for consumer's life style to be changed. Thus the new mobile payment platform will be integrated into the customer's

routine shopping process without the need of additional and difficult steps, devices (such as two factor authentication tokens) or skills. Therefore, the mobile payment needs to increase the speed and the convenience in comparison to the traditional shopping process.

A number of scholars [82, 83, 84, 85, 86] have considered compatibility as a strong antecedent of mobile payment adoption in their studies.

H9: There is a relationship between Compatibility and Behavioral Intention to Use Mobile payments

J. Demographic Characteristics

Scholars have used Demographic characteristics to further explain how a consumer's age and knowledge correlate on the adoption of new technologies. Grabner and Breitenecker [87] reveal that on average online banking users are younger and have a higher educational level.

H10: Age group moderates the relationship between Behavioral Intention to Use Mobile Payment and Mobile payments usage

H11: Level of Education moderates the relationship between Behavioral Intention to Use Mobile Payment and Mobile payments usage

Based on the literature review, a conceptual framework was developed as depicted in figure 3.1

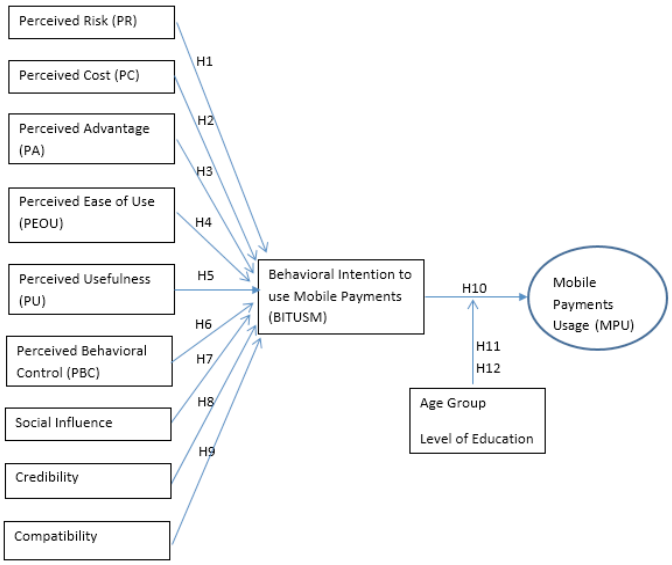

Figure 3.1: Proposed Conceptual Model

IV. Methodology

The proposed research is of quantitative nature. The questionnaire will be formulated based on the reviewed literature and existing survey instruments. The questionnaire will contain domains covering Perceived Risk, Perceived Cost, Perceived Advantage, Perceived Ease of Use, Perceived Usefulness, Perceived Behavioral Control, Social Influence, Credibility, Compatibility, Behavioral Intention to use Mobile Payments, Mobile Payment Usage and demographic information covering Age and Level of Education. Once the research questionnaire is finalized, it will be pilot tested to ascertain whether the constructs fulfil both validity and reliability requirements.

This is a hypothesis testing study, and the hypotheses will be tested using SPSS. The population of the study is the people who are already using mobile devices and who are keen on using mobile devices for making payments. The sample for the study will be selected on a random basis.

V. Discussion

The mobile payment space is becoming more competitive every day with changing consumer behavior and rapid technology advancements. For businesses, mobile payments present a unique opportunity to connect with customers thus delivering a better value proposition. From a consumer's perspective, mobile payments offer the fundamental requirements of simplicity, safety and responsiveness.

From a government's perspective, mobile payments offer significant benefits for both citizens and government agencies. Mobile payment platforms also have the potential of addressing financial inclusivity while enabling governments to save money on managing the entire physical currency supply chain. Further, mobile payments can enable more cost effective, efficient, transparent and secure means of enabling payments.

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