

# Applying Transaction Cost Theory and Push-Pull-Mooring Model to Investigate Mobile Payment Switching Behaviors with Well-Established Traditional Financial Infrastructure

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## Abstract

The technology of mobile payments has received more attention than ever. However, whether it is possible that mobile payment will become a common payment method for consumers depends on the willingness of consumers. This study focuses on the intention from cash payment to mobile payment and adopts a qualitative and quantitative approach based on the theoretical structure of the Transaction Cost & the Push-Pull-Mooring Migration Model of Service Switching. Firstly, the Delphi Method was applied to extract three push variables (perceived trouble, perceived lack of transaction records, and difficulty of paying large amounts in cash) and three pull variables (perceived convenience, perceived benefit, and perceived time-saving). After surveying 586 samples, this proposed model was tested with a structural equation modeling approach. Results: 1. the pull facet tends to be more significant than the push facet. 2. Perceived trouble had a significant effect on push factors, while perceived convenience and perceived benefit had a significant effect on pull factors. 3. Push-&-pull factors had significant effect on behavior of gender-&-age. And the-transaction-costs can divide into positive-transaction-costs and negative-transaction-costs after incorporating the Push-Pull-Mooring theory.

**Keywords:** Mobile payment, Transaction cost theory, Push-pull-mooring, Habit, Intention

## 1 Introduction

According to the State of the Industry Report on Mobile Money published by the Groupe Spécial Mobile Association (GSMA) in 2017, mobile payments will impact at least 11 of the world's 17 Sustainable Development Goals (SDGs), such as farmers selling goods using mobile payments and increasing purchasing power. Thus, mobile payment is an important foundation for future economic development. Many economies around the world have begun to promote and encourage mobile payments. We can observe that activities around the world are increasingly related to wired, wireless, and sensor networks, and that smartphones have become extremely popular. According to the U.K.'s financial report, it is expected that the proportion of cash payments will not exceed 21% by 2026. A Statista survey compiled by the Market Intelligence and Consulting Institute (MIC) in December 2017 shows that the penetration rate of mobile payments in 2016 was 20.4% in Singapore and 17.4% in China, and it is estimated to reach 37% and 28.6% in 2020, respectively. Japan has even set a target mobile payment ratio of 80% in 2025, which demonstrates the importance of mobile payment.

However, according to an eMarketer survey, the average global penetration rate for proximity mobile payments in 2018 was only 13.2% and that of mobile payments is generally low, especially in advanced countries with a sound financial infrastructure, where the pace of development was slower than expected. For example, the non-cash (including mobile) payment ratio in Japan was only 23.2% in 2018, and it will increase to 25.2% in 2019; and despite efforts being made, progress remains slow. Similarly, according to the prediction made by the market research agency eMarketer (2018), only 55 million people in the U.S. used mobile payment in 2018. Such number only constitutes 20.2% of the total population in the U.S. Moreover, according to the September 2019 estimate by eMarketer, the number of mobile payment users in the U.S. will increase to 64 million in 2019, with a penetration rate of 23.5%. That compared with the rapid adoption and growth of global mobile technology, the adoption of mobile payment services is slower than expected. Therefore, stimuli that can popularize mobile payments are crucial [33]. Therefore, this study aims to understand the cause of the low usage rate of mobile payment in countries with well-established financial infrastructure as well as the factors contributing to the intention of switching behavior from cash payment to mobile payment.

Good relevant financial infrastructure refers to good existing traditional financial infrastructure. Financial infrastructure is defined as an institution, information, technology, rules, and standards that enable financial activities (including financial intermediaries), according to IGI Global.

Cash transaction has been the dominating payment habit in Asian countries since ancient times. Around ten years ago, the Taiwan government lowered the criteria on issuing credit cards to individuals. This gave rise to a vicious competition between different debit card and credit card companies. As a result, a considerable number of consumers became victims of heavy credit card debts, and the government had to take legislative measures to resolve such issue. This incident caused the public to prefer cash transactions in their daily life. According to the Financial Supervisory Commission of Taiwan report in 2019, there was one automatic teller machine (ATM) per 772 people in Taiwan, representing the highest density of ATMs in the world. However, the Taiwanese government began by restricting non-bank companies from operating mobile payment services (to protect the rights of banks) and then passed a law in 2015 on electronic payments that allowed private telecommunications companies to apply for electronic payment services. In 2017, the government started to proactively encourage mobile payment. Although in 2018, the National Communications Commission announced that the penetration rate of smartphones in Taiwan households reached over 90% and that of 3G and 4G broadband Internet access 100%, mobile payment still has not become popular among public as fast as expected.

In addition, according to a research work performed by the Taiwan Institute of Economic Research (TIER) in 2017, the development of financial technology in China exhibits a distinctive pattern: when the legislative regulation falls behind the financial development, the government will allow financial technology to grow in a crude manner (unconstrained, unlimited by legislative regulation). Official actions had to wait until 2016, when the Chinese government started to issue and implement *Administrative Measures for Online Payment Business of Non-Banking Payment Institutions*.

Similarly, while Japan has a fairly sound financial system as well as a well-developed mobile payment technology, cash transaction still remains an important component for most Japanese people. According to a report by Wall Street Journal (U.S.) published on March 4, 2019, around 47% of the total Japanese population still practices cash transaction.

Smart phones are popular in our daily life. The conveniences provided by credit cards and mobile payments and the impact of convenience on willingness to pay [7]. The study indicated that mobile payments typically charge the original cards (such as credit and debit cards); that is, the collection method of the handling fee for mobile payments should be identical to card payments, which are both non-cash payments. While mobile phones provide many non-payment functions (for example, social media, gaming, photography), this study focuses on the consumer behavior of cash payment and mobile payment. Actually, it has practically become another organ of the human being in the contemporary world. Based on this background, this study adopts a Push-Pull-Mooring (PPM) model to examine the

factors that lead to consumers' intention to use mobile payment under the existing domination of cash transactions. In addition, this study also explores the differences in the usage of mobile payments between different groups. Finally, it is hoped that when the existing financial environment is highly developed, the results of this study will be able to provide positive response measures for the government and the industry to promote mobile payment.

## 2 Theoretical Background

The established financial technology in Taiwan is highly sophisticated; as mobile payment and card payment are both non-cash payments, this study focuses on user behaviors associated with cash and mobile payments. The research is based on a sound traditional financial infrastructure, and the Delphi Method is applied to investigate relevant variables.

### 2.1 Mobile Payment

Mobile payment services have the potential for financial inclusion in developing economies [65]. And Wamariya & Loebbecke [59] proposed that mobile payment (m-pay) has always been the main driving force for the social and economic development of emerging markets. That mobile technology exists in our daily lives as a norm [82]. Although technology exists, mobile payment services are not used very frequently. Hence, there are still some incentives for consumers to accept mobile payment.

Trust has also been identified as an important determinant of the use of mobile payments [104]. That convenience, sense of enjoyment, and economic benefits will all yield a positive impact on the users' attitudes when using mobile payments [43]. Identifying usefulness, perceived ease of use, and compatibility can affect initial usage [91]. Karimi and Liu [72] proposed to analyze the adoption of mobile payments using the affect infusion model, revealing that consumer emotions affect the decision to adopt in-store mobile payment services.

In addition, the ease of use, perceived risk, personal innovation, perceived usefulness, subjective norms, and perceived benefit are also factors that affect the adoption of mobile payments [42]. Those researchers suggested that consumers in online payment transactions may choose mobile payment for these transactions based on the security, fees, usefulness, ease of use, and their favorite web browser [93].

In academic research, most studies focus on the technology aspect, such as the technology acceptance model ([13], [18], [69]) the diffusion of innovations theory ([53], [87]), the transaction cost theory [78], trust ([9], [61], [107]), and security [96], among other factors ([39], [96]). Kalinic et al. [46] stated that the consumers will take the applicability of P2P M-pay as the primary factor for determining whether to choose mobile payment or not. Meanwhile, as the ownership rate of smart devices, such as smartphones and smart watches, is continuously increasing, mobile payment has become the preferred payment method in many different areas. Further, the support of cryptocurrency payments on mobile devices has become a new method of mobile payment [49].

Most research on mobile payment explores usage intentions from a technological perspective, focusing on payments using near field communication (NFC), host card emulation (HCE), infrared, soundwaves, QR codes, or SIM cards. For example, de Reuver and Ondrus [20] found that consumers preferred HCE or payment methods with embedded security components. Ghezzi et al., [30] defined mobile payments as financial transactions conducted through a mobile network or any wireless network technology (e.g., NFC, Bluetooth, RFID) in a secure environment, using a mobile device in at least one stage of the transaction. Park et al., [43] suggested that the satisfaction, service quality, anticipated workload, and anticipated risk are factors for continuous intention to use NFC technology in mobile payment. Oliveira et al., [64] suggested that *forward-looking technology* has added a lot of new functions to new mobile devices, such as making general payments and bank transfers. In the literature, most studies on customer usage of mobile payments have focused on the technology [33].

Some studies have utilized the usage intention as a variable to investigate the willingness to adopt mobile payment. For example, drew on Status Quo Bias theory and coping theory to study how the use of incumbent web payment (WP) services affects users' intention to use new mobile payment (MP) services [98]. The adoption behavior of mobile payment service (MPS) is the result of the interaction between the characteristics of MPS and contextual factors, such as purchase intention and time pressure [97]. Simply states that mobile payments are payments made through mobile devices. Based on the above, this study defines a mobile payment as "a payment conducted online or offline that uses a mobile device as a payment tool." [53]

### 2.2 Transaction Cost Theory (TCT)

The British Nobel laureate in economics Ronald Coase proposed the concept of transaction cost theory in 1937 [16]. He defined the theory as focusing on saving transaction costs, analyzing each transaction as a single unit, and distinguishing the characteristics of various transactions. He then analyzed and classified different transactions to facilitate coordination by specific bureaucratic organizations. He pointed out that transaction costs are the costs required for obtaining accurate market information. Such costs are ubiquitous and affect all economic activities. The

transaction costs include the sum of costs required for searching information, negotiation, contracting, management compliance, and handling of breach of contract. The transaction costs can coordinate the organizational behavior towards better justice, order, and security. Williamson [23] believed that the transaction costs emerge from the market failure caused by the interaction of various factors of human nature and relevant factors of the trading environment. These interactions make transactions more difficult to occur. Dahlman [17] categorized the content of trading activities and stated that the transaction costs include the costs associated with searching information, negotiation and decision-making, contracts, supervision, execution, and conversion costs. Coase found that in the agricultural era, most people were self-employed, but once society entered the industrial age, people began to establish companies and cooperation. This change created transaction costs in the market. However, in the current Internet era, the network reduces the transaction costs of the market, production costs within companies, and costs of information exchange. Across different industries, standardized procedures and international certifications have impacted the cost of research and communication. When parties benefit from long-term cooperation within supply chains, the assessment mechanism of market openness further alleviates the problem of speculation and information asymmetry. Studies about transaction costs are on the rise, and many researchers are focusing on marketing predictions, especially Anderson & Schmittlein, Dwyer & Oh, and Klein [1], [66], [73]. For Williamson [24], there are ex ante and ex post transaction costs, and different transactions typically involve different types of transaction costs. Therefore, we observe that the reduction of transaction costs has a guiding incentive on the choice behavior of the decision makers. Meanwhile, every consumer is a decision maker when trading, and transaction cost considerations empower consumers to select the options that are good for themselves.

Lin and Lin [70] stated that improving the transparency of medical information will reduce the transaction costs associated with medical behavior and hence will enhance people's well-being. Akbar and Tracogna [100] pointed out that the three transaction cost factors, namely the transaction frequency, the uncertainty, and asset specificity, will affect the competition between hotels and room sharing platforms such as Airbnb. Yuen et al., [25] argued that the impact of convenience, privacy security, and reliability on the customers' intention are entirely regulated by the perceived value and transaction costs. Therefore, the transaction costs will have a huge impact on the customers' intention.

Miron, Purcarea and Negoita [88] believed that information control will lower the perceived environment uncertainty and will imply perceived risk. Furthermore, it will reduce the transaction costs. Therefore, the general transaction costs refer to any cost incurred to facilitate the transaction. Consumers are simultaneously decision makers of the transaction, and the transaction costs are not just money. Basically, time-consuming, laborious, untrustworthy, and inconvenient factors will increase transaction costs [70], while time-saving, effort-saving, trustworthy, and convenient factors will reduce the transaction costs [90]. Consumers will evaluate whether the total transaction cost is optimized for determining whether to adopt or convert their trading behavior. Therefore, increasing transaction costs will negatively impact consumers, while reducing transaction costs will positively impact consumers. Wang & Dai [47] noted that compared with perceived usefulness and social influence, attitude is the most important factor affecting users' intention to use offline mobile payment. Lin, Wang & Huang [99] stated that social norms and social self-image play a vital role in the use of mobile payment services. Furthermore, perceived benefits (relative advantages and service compatibility) and perceived costs (security risks and perceived expenses) determine users' perceived value. Thus, the transaction cost should be considered to be a crucial factor affecting intention.

### 2.3 Push-Pull-Mooring Theory

Push-Pull-Mooring (PPM) theory has become one of the best explanations of migration. It explains why people migrate from one place to another at a given time [4]. Push factors are the negative influences that force individuals to leave their origin, while pull factors are the positive influences that attract individuals to a specific destination [10], [40]. PPM theory can be applied to many consumer behavioral transformations. Bansal, Taylor and Jame [4] applied this theory to consumers' intentions to switch service providers. Since then, PPM has been applied to the study of multiple behavioral intents, such as the switching of virtual social networks [10], [38], [102], instant messaging (IM) service applications [105], physical shopping to mobile shopping [12], online games [103], choice of airlines [41], mobile stores [92], and adopt PPM, to investigate consumers' intentions to switch from conventional vehicles to green vehicles [81]. In 2019, Chen et al. [14] also used PPM to study the switching intention regarding mobile personal cloud storage services. Zhang et al. [34] applied PPM to study the loyalty shift of Chinese consumers regarding mobile services. Fang and Tang [101] suggested that PPM can be used to explain why IM users are more likely to suffer from involuntary switching as competition may eliminate their service/technology providers. There are also many switching behaviors online that may be described by PPM. For example, Zhang, Cheung, and Lee [108] studied the switching of online blog services. Lai and Wang [44] combined the PPM model with habits to formulate a PPMH model to better understand the conversion intentions of cloud healthcare services among middle-aged and elderly patients and successfully contributed to medical research. Chou et al. [79] also applied PPM to explore the free-riding behavior of consumers within the channel and cross-channel in a multi-channel environment. Applying PPM migration theory, Hou, et al., [37] discussed the switching behavior in massively multiplayer online role-playing games (MMORPGs) after entering a new virtual world. Bansal, Taylor and Jame [4] argued that the PPM migration model performs better than the substitution model. The push, pull, and mooring aspects of migration have a significant direct impact and moderating effect on switching intentions. Recently, there have also been studies on mobile payments that adopted PPM as the theoretical framework. For example, Wang et al. [48] applied PPM to discuss the influence of privacy, monetary rewards, self-efficacy, past investments, and economic values on the

conversion behavior of mobile payments. Therefore, in this study, push factors were applied to investigate the results of abandoning cash payments, and pull factors to examine the results of attracting the usage of mobile payment.

## 2.4 Habit Theories

A habit is a representation of adaptation to the environment [19]. Bargh [5] argued that a cognitive habit is an automatic and subconscious behavior. A habit is also considered a long-standing behavior that is difficult to change [6], [68]. Research on habits suggests that they are often thought to occur as a result of repeated behavioral responses [80]. Verplanken and Wood [94] defined a habit as an automatic response that develops as people repeat their actions. A habit is also defined as the automatic association of specific clues and actions that are formed by memory through a certain amount of repetitive learning or practice [51], [86]. Wood and Neal [95] suggested that habits develop as people react repeatedly. Nilsen et al., [63] showed that habits are formed by an already repeated behavior. Since behavioral responses can be expressed as actions or behavioral intentions, it can be reasonably assumed that habits may reflect a change in behavioral intentions. It is worth noting that the initiation of the behavior necessary for repetition is clearly intentional [29], and habits are thought to stem from the identity of the target [35].

Habits are often defined as the learning of a sequence that forms an automatic response to particular cues, and the functional response achieves certain goals and results [80]. Some studies have used habits as a premise of intent [36], [71], [75], while others consider habits as the moderators and usage of intention [32], [62]. In other words, once an action develops into a habit, its impact on behavior will last for a long time without disappearing. Therefore, this study applies habits as a mooring moderating variable and explores whether it has a significant impact on abandoning cash payment and switching to mobile payment.

## 3 Research Model and Hypotheses

The traditional payment behavior is to use cash payments. However, with the increase in smartphone usage and the development of mobile payments, payment practice has also changed. Card and mobile payments are both non-cash payments. In this regard, this study focuses on the consumer behavior toward cash and mobile payments. The research is conducted in the following steps:

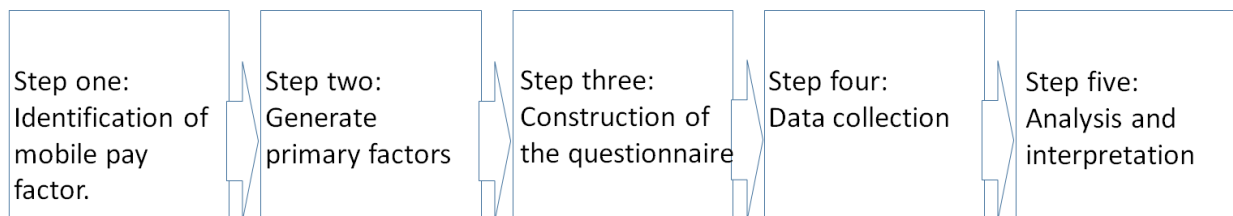


Figure 1: Flow chart of the research method

To illustrate, the flow chart of the research method in this study is shown in Figure 1, and the details are as follows:

Step one: Identification of mobile payment factor.

The factors required for mobile payments will be established through an in-depth examination and research before construction of the questionnaire. The identification of factors is accomplished by using the Delphi Method. One of the most common methods for identifying customer expectations and intentions is the personal interview survey.

In comparison with other survey methods, the main advantages of the personal interview survey method include the higher willingness of subjects to answer personal questions and a higher level of objectivity. The main advantage is the increase in interaction with subjects. In addition, the personal interview survey method often yields a higher response rate than other survey methods. A total of 15 reasons for disliking cash payment and 15 reasons for preferring mobile payment were extracted to generate the measurable variables.

Step two: Generate primary factors.

We utilized focus group methods to gather 50 people to vote. The first three factors of pull and push were generated. The top three factors for disliking cash payment were as follows: (1) perceived lack of transaction records, (2) difficulty of paying large amounts in cash, and (3) perceived trouble. These factors were considered to be the push factors. The top three factors for preferring mobile payment were as follows: (1) perceived convenience, (2) perceived benefit, and (3) perceived time-saving. These factors were considered to be the pull factors.

Step three: Construction of the questionnaire.

We developed the questionnaire based on the factors identified in step two.



Step four: Data collection.

Teo proposed that online questionnaires have several advantages, such as lower implementation costs and faster response rates, as well as without geographic restrictions, over traditional paper-based surveys. The survey was conducted from April 26 to May 9, 2018. It was primarily promoted on the Bulletin Board System (BBS), Facebook page, and related bulletin boards. Respondents who clicked on the questionnaire URL were led to the survey instrument. All respondents participated voluntarily. Each participant was required to answer every question in the online survey. A total of 614 questionnaires were collected, and after eliminating those questionnaires with errors, 586 questionnaires were considered valid.

Step five: Analysis and interpretation.

Two methods are used to interpret the results. First, we apply structural equation modeling (SEM); this study used AMOS 18 to process a two-step statistical analysis of convergent and divergent validity and verified the research hypotheses and structural model framework. We interpret the results using two methods. The first method is to look at the distribution table where the frequency of the responses for each function is shown. Second, verify where the function fall; this would be deemed to fall within the category that has the highest frequency value.

### 3.1 Pre-Study

This study interviewed five mobile payment experts (including a senior executive in the financial industry, the Chief Secretary of the Ministry of Economic Affairs, the government think tank MIC, an ICT academic professor, and a financial information industry professional), to understand the predictive factors of consumer preference for cash and mobile payments according to them. Applying the Delphi Method, 15 reasons for disliking cash payment and 15 reasons for preferring mobile payment were extracted to generate the measurable variables. These variables were turned into questions (see Table 1 and Table 2). Convenience sampling was used to gather 50 people to vote (up to five votes per person). After the vote, the first three factors in two voting result tables were found to be significantly different from the rest of the factors. Therefore, the first three factors were taken out from the table. The top three factors for disliking cash payment were as follows: 1. perceived lack of transaction records; 2. difficulty of paying large amounts in cash; and 3. perceived trouble. These factors were taken to be the push factors. The top three factors for preferring mobile payment were as follows: 1. perceived convenience; 2. perceived benefit; and 3. perceived time-saving. These factors were taken to be the pull factors. Based on the prior theoretical discussion, we found that the first three factors, which disfavor cash transaction but favor mobile payment, are all related to transaction costs. The pushing force that drives consumers to depart from cash is classified as the push factor, whereas the pulling forces that drive the consumer to use mobile payments are classified as the pull factor.

Table 1: Ranking of push factors

| Rank | Statement   | Number of ticks |
|------|---|-----------------|
| 1    | Transactions are not recorded (to confirm the payee and payer in the transaction; without receipt).               | 26              |
| 2    | Large cash payments are inconvenient.   | 25              |
| 3    | Finding change and counting bills when carrying cash causes trouble.  | 24              |
| 4    | Cash advances are impossible.   | 17              |
| 5    | Bills risk being lost or robbed, as they bear no record of names and cannot be recovered.                         | 17              |
| 6    | Cash is easily damaged, and it is easy to receive counterfeit, old, and damaged bills.                            | 16              |
| 7    | The wrong change may be given in a transaction.   | 16              |
| 8    | Cash creates a heavy burden, as it is necessary to carry a heavy wallet or a purse to hold cash.                  | 15              |
| 9    | Cash is unsanitary, as it has passed through many people's hands and accumulated many bacteria.                   | 15              |
| 10   | It takes a lot of time to count money, and people need to wait during transactions.                               | 13              |
| 11   | Transactions cannot be made everywhere (cross-space trading).   | 13              |
| 12   | Cash is subject to issuing restrictions in different countries (foreign exchange is necessary when going abroad). | 13              |
| 13   | People cannot make transactions at all times (money transfers).   | 12              |
| 14   | There is no automatic billing available.  | 10              |
| 15   | Cash on hand does not appreciate in value (no interest).  | 6               |

Table 2: Ranking of pull factors

| Rank | Statement   | Number of ticks |
|------|---|-----------------|
| 1    | Going out is convenient. Just bring a smart phone, no need for cash or cards.                         | 28              |
| 2    | There are generally discounts, bonuses, and points for using smartphones for payment.                 | 28              |
| 3    | The overall checkout time is reduced using smartphones.   | 25              |
| 4    | It can effectively control personal financial and transaction records, and is convenient for inquiry. | 16              |
| 5    | You can enjoy the benefits of pre- and post-payments.   | 16              |
| 6    | You can freely make transactions everywhere.  | 16              |
| 7    | You can freely transfer payments at any time.   | 15              |
| 8    | The payment experience is excellent and easy to operate.  | 15              |
| 9    | You can participate in organizations and make direct payments.  | 14              |
| 10   | Using smartphone payments demonstrates the advanced status of an individual.                          | 13              |
| 11   | Many stores are already accepting mobile payment; thus, you would use mobile payment too.             | 13              |
| 12   | Automatic foreign exchange is available when going abroad.  | 13              |
| 13   | Without cash in hand, you will not be robbed of money.  | 10              |
| 14   | The figures are clear and there are no payment errors.  | 9               |
| 15   | Mobile payment transactions generate electronic invoices that are automatically reconciled.           | 7               |

This study obtained push and pull factors based on the theoretical basis of TCT, PPM and the pretest results. As Kahneman and Egan [45] argued that habit has a mooring or anchoring effect, this study also applied habit as a mooring variable. The research model is shown below (Figure 2):

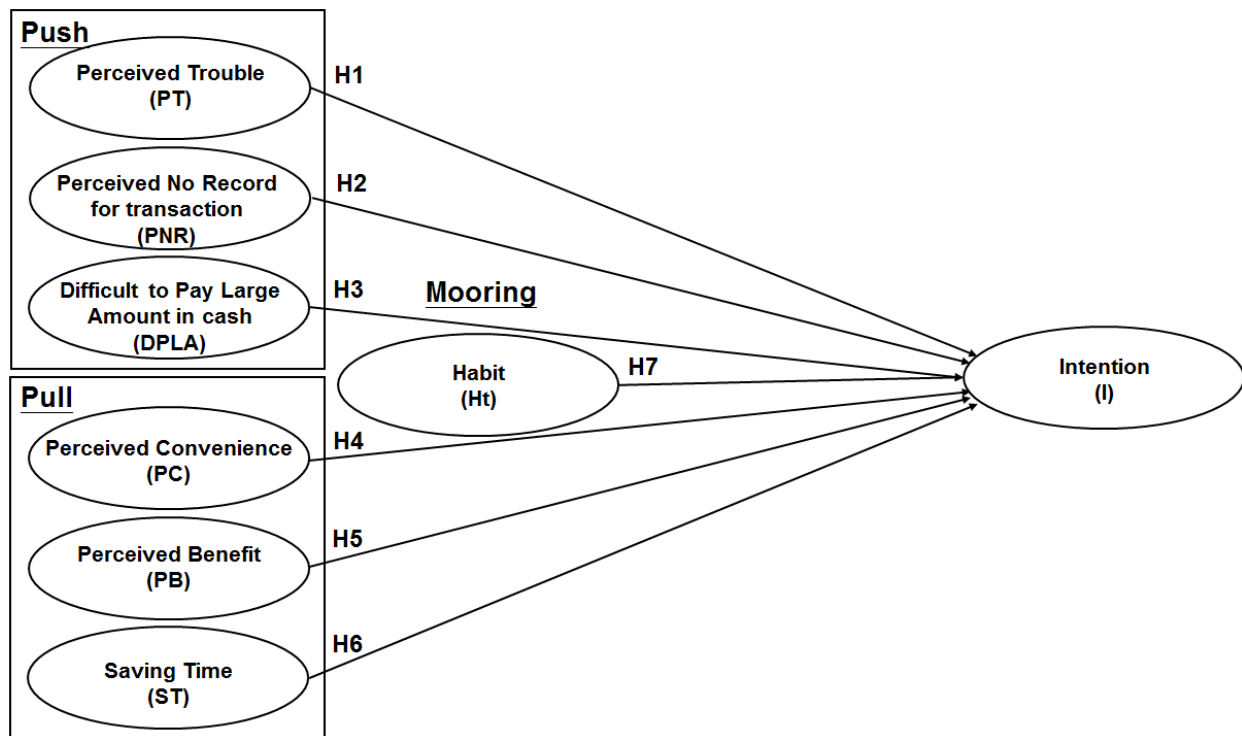


Figure 2: Proposed research model

### 3.2 Push Effects

Push and pull factors are phenomena observed from different perspectives over a certain period of time [76]. Push factors are influencing factors that push an individual away from the original situation, which reflects dissatisfaction with the existing location, environment, or service, and the desire for other options. Considering cash payment, a push factor is any factor that motivates consumers to abandon intentions of using cash to pay. The development of transaction costs stems from barriers caused by the market failures between people and factors in the trading environment, resulting in problems such as bounded rationality, opportunism, uncertainty and complexity, small numbers, and information asymmetry [23].

In terms of cash payment, such push factors include the perceived trouble of using cash, counting bills and change, and carrying a heavy wallet. Thus, consumers perceive cash payment as trouble. Hence, according to the transaction cost theory, consumers feel they have to pay extra costs, including trouble. Thus, we hypothesize:

*H1: Perceived trouble can positively significantly affect the intention of consumers to switch from cash to mobile payment.*

There are no records in cash payment (only the receiving and paying parties know about the transaction). For example, consumers may pay cash to small vendors, pay tips to restaurant servers, or give cash to service providers, elders, or children. As such transactions have no records, there is risk. Either party may deny that they have received or paid money after a transaction or they may not be able to confirm whether an incorrect amount was delivered. Therefore, this record-free characteristic of cash payment becomes a push factor for users who wish to clearly understand their accounts. If a consumer has a feeling of uncertainty about a transaction owing to the lack of evidence or confirmation, it leads to risk. Thus, we hypothesize:

*H2: The lack of transaction records can positively significantly affect intention of consumers to switch from cash to mobile payment.*

Consumers generally do not carry a lot of cash when they are out. If they wish to purchase expensive items, such as computer, communication, and consumer electronics, collectively known as 3C goods (e.g., computers or smartphones), refrigerators, and automobiles, or travel abroad, they may need to bring a lot of cash or find the closest ATM to withdraw money. Thus, for those who often need or want to conduct large cash transactions, cash payment may cause inconvenience. There may also be a risk of losing cash or being robbed, hence carrying large amounts of cash is inconvenient and unsafe. For consumers, it is not easy to pay for high-priced goods in cash. This demonstrates how cash cannot be safely and conveniently applied and such inconvenience should also be considered a cost. Thus, we hypothesize:

*H3: The difficulty of paying large amounts in cash can positively significantly affect the intention of consumers to switch from cash to mobile payment.*

### **3.3 Pull Effects**

Pull factors are generally attractive factors. For example, greater job opportunities in a new destination drive consumer immigration, sourcing new services to provide more satisfactory incentives drives consumers to purchase new services, and matching new products with consumer preferences attracts consumer usage. Mobile payment has an advantage as people carry communication devices anyway, and providing smart payment services reduces the need to bring cash. As long as you hold a smart mobile device, you may use it to pay for transport, shopping, dining, and entertainment. Chang, Yan, and Tseng [11] found that convenience is one of the characteristics of mobile learning, and perceived convenience affects the attitude and intention of using mobile technology. The perceived convenience of mobile technology has an important effect on improving the performance of hotels. Okazaki and Mendez [74] considered convenience a crucial factor of e-commerce. Thus, we hypothesize:

*H4: Perceived convenience can positively significantly affect the intention of consumers to switch from cash to mobile payment.*

Mobile payment service providers usually offer bonus points, rebates, and other incentives. Some may even use freemium strategies, offering further bonus points for promotion (e.g., China's DiDi linking rides with mobile payment services). The application of technology allows consumers to fully grasp the records and advantages of benefits. Consumers may also be able to use diversified discounts while conducting transactions in other fields. This effectively attracts consumers to use mobile payment to obtain discounts, forming an impression incentive that mobile payment offers discounts. Forsythe et al., [28] argued that for consumers, online shopping brings incentives and risks of perceived benefit. They believed that perceived benefit has management implications for customer loyalty programs. For example, China's Alipay uses a number of discount offers to attract and retain consumers (e.g., no service charges, offering bonus points) and offers bonuses for purchases made with certain credit cards. Thus, we hypothesize:

*H5: Perceived benefit can positively significantly affect the intention of consumers to switch from cash to mobile payment.*

Most mobile payment services facilitate transactions or transfers using sensors or scanning, either online or offline. Fast mobile payment saves time, allowing consumers to avoid the slower process of counting money and obtaining receipts. Consumers can make transactions anytime and anywhere, so they feel that saving time reduces transaction costs, which is an important advantage in the digital economy era [77].

Most people dislike waiting and wasting time. If the processing time is too long, customers easily feel impatient and may choose to give up their purchase. For those who see time as a cost, time becomes capital, and the waiting itself is considered a waste of time [52]. Consumers perceive that time is spent in the process of purchasing, and the



actual timespan of the transaction affects their assessment of the overall transaction [2]. Therefore, in terms of pull factors, perceived time-saving is an important incentive to attract consumers. Limayem, Khalifa, and Frini [57] argued that time-saving is an important factor among the incentives for consumers to shop online. Thus, we hypothesize:

*H6: Perceived time-saving can positively significantly affect the intention of consumers to switch from cash to mobile payment.*

### 3.4 Mooring Effects

A habit is an instinctive consumer behavior that effortlessly displays their preferences [77]. Kahneman and Egan [45] revealed that habits bring inter alia shortcut, preference, and mooring or anchoring effects. Bargh [5] suggested that perceived inertia is automatic and subconscious behavior. A habit is a long-standing behavior that is hard to change [6] when people are not familiar with doing certain things, the process of doing those things takes a long time. For example, if consumers typically purchase products through a platform, they are more familiar with the user interface than they were in their previous shopping experiences. Therefore, perceived inertia, thoughts, and behavior are subconscious habits. Chiu et al., [15] believed that familiarity with the website interface and payment procedures enables consumers to execute and complete repeat purchases with minimal effort. There is a close relationship between consumers' attention to transaction costs and their habits.

The above analysis fully demonstrates the regulating effect of mooring that habits should have on human behavior. In everyday life, habits are often defined as behaviors that are automatically prompted by contextual cues as a result of behavioral associations of learned stimuli [50]. Habits help us to accept the enormous complexity of everyday life. In general, we believe that customary factors positively or negatively influence consumer behavior, thus impacting the switch from cash to mobile payment. Therefore, we take habits into consideration and hypothesize the following:

*H7: Habits can positively significantly affect the intention of consumers to switch from cash to mobile payment.*

## 4 Research Methods

We conducted a questionnaire survey and collected 586 questionnaires. Then, we applied SEM; this study used AMOS 18 to process a two-step statistical analysis of convergent and divergent validity and verified the research hypotheses and structural model framework.

### 4.1 Sampling and Data Collection

This study only collected samples in the form of questionnaires on the Internet because online questionnaires have several advantages, such as lower implementation costs and faster response rates, as well as without geographic restrictions, over traditional paper-based surveys. In addition, we are more interested in the demographic groups who have access to the Internet and use cash payment. The reasons are as follows:

- (1) Because of the universal access to education in Taiwan, according to the release published by the Ministry of the Interior in 2019, at the end of 2018, the household registered population of people aged 15 and over was 20.541 million, and the literacy rate had reached 98.9%; the majority of the education level was graduates of institutions of higher education (9.350 million, 45.5%), and it had increased yearly, increasing by 40% in 10 years. Meanwhile, the number of university graduates increased by 2.064 million (+ 58.8%). According to the release published by the National Development Council in August 2019, the ratio of mobile users using unlimited data plans with telecommunication service providers reached 79.2% in 2019, whereas 19.3% of the users selected prepaid data plans from the telecommunication service providers. There were 122 numbers per 100 users, and the rate of mobile Internet usage was 86.5%. Further, as reported in the 2019 survey released by TWNIC at the end of 2019, the estimated number of Internet users aged 12 and over in the country was 18.98 million, and the number of Internet users in the country has been estimated to reach 20.20 million, with an overall Internet access rate of 85.6%. The household Internet access rate reached 90.1%: the majority was through the broadband Internet, with a ratio reaching 89.3%. The survey also indicated that the ratio of individuals aged 12 and over who reported having ever accessed the Internet reached 89.6% this year. The number of Internet users across the country exceeded 20 million for the first time; the age group with the largest increase in the Internet access rate was the age 55 and over demographic group, with a total increase of 20%. According to the data of Comscore MMX as of September this year, although Taiwan has a small population (23 million), the average number of pages viewed per person ranked first in Asia. Accordingly, this survey selected online questionnaires as the sampling and data collection method considering that most cash payment users should have Internet access, especially through mobile phones.
- (2) Because *Mobile* payment is a type of online payment, the focus of this study is the behaviors of online users.

The study requested paying users in Taiwan to fill out online questionnaire surveys. Teo [89] proposed that online questionnaires have several advantages over traditional paper-based surveys, such as lower implementation costs and faster response rates, as well as having no geographic restrictions [77]. The survey was conducted from April 26 to May 9, 2018. It was mainly promoted on a Facebook page and related bulletin boards. A total of 614 questionnaires was collected, and after eliminating those with errors, 586 questionnaires were considered valid. The respondents consisted of 311 (53.1%) males and 275 (46.9%) females. Over half (56%) of the respondents were between the ages of 21 and 30, and 86.9% were under the age of 50. In terms of education level, 99.3% had received some college or graduate education. Table 3 summarizes the demographic data of the respondents.

Table 3: Sample demographics

| Measure         | Item                  | Number | %      |
|-----------------|-----------------------|--------|--------|
| Gender          | Male                  | 311    | 53.1%  |
|                 | Female                | 275    | 46.9%  |
| Age             | Below 20              | 68     | 11.6%  |
|                 | 21-30                 | 263    | 44.7%  |
|                 | 31-40                 | 84     | 14.3%  |
|                 | 41-50                 | 96     | 16.3%  |
|                 | Above 51              | 75     | 12.3%  |
| Education level | Secondary/High School | 2      | 0.003% |
|                 | College/university    | 298    | 50.7%  |
|                 | Master/PhD            | 286    | 48.6%  |

## 4.2 Variable Measurement

All survey questions were measured on a five-point Likert-type scale, from *strongly disagree* (1) to *strongly agree* (5). The design of the questionnaire is based on the Delphi Method. First, interviews were conducted with five mobile payment experts, to find the predictive factors of consumer preference for cash and mobile payments according to them. Second, we repeatedly confirmed the experts' consistency with the items and factors to reach a consensus. We can see the summary of all survey items in Table 4.

Table 4: Summary of all survey items

| Items   |
|---|
| Perceived Trouble (PT)<br>1. I believe carrying change is inconvenient.<br>2. I believe counting bills when making a transaction is troublesome.<br>3. I believe it is inconvenient to count the change when making a transaction.  |
| Perceived No Records for transaction (PNR)<br>The extent of not having payment records for cash payments<br>1. I believe paying in (receiving) cash leaves no transaction receipt.<br>2. I believe paying in (receiving) cash leaves no transaction evidence.<br>3. I believe paying in (receiving) cash renders the transaction untraceable. |
| Difficulty of paying large amounts in cash (DPLA)<br>1. I believe spending (receiving) a lot of cash is inconvenient.<br>2. I believe carrying a lot of cash for payment is inconvenient.<br>3. I believe bringing a lot of cash for transactions is inconvenient.  |
| Perceived Convenience (PC)<br>1. I believe using mobile payment makes it convenient for me to go out without cash.<br>2. I believe it is convenient that only a cell phone is needed for using mobile payment to complete transactions.<br>3. I think mobile payment is a very convenient payment tool.                                       |
| Perceived Benefit (PB)<br>1. Offering discounts, bonus points, and cash rebates is attractive to me.<br>2. Offering discounts, bonus points, and cash rebates gives me payment incentives.<br>3. I enjoy the benefits of discounts, bonus points, and cash rebates offered by mobile payment.   |
| Save Time (ST)<br>1. I believe using mobile payment allows me to complete the transaction quickly.<br>2. I believe using mobile payment saves transaction time.<br>3. I believe using mobile payment allows me to shorten the transaction time.   |

| <i>Table 4: continuation</i> |  |
|------------------------------|--|
| Habit (Ht)                   | 1. Choosing my current payment method has become an automatic action for me.<br>2. It is natural for me to use my current payment method.<br>3. When I need to make a payment, using my existing payment method is an obvious choice for me. |
| Intention (I)                | 1. I am willing to try to pay mobile payment.<br>2. In the future, I am willing to use mobile payment.<br>3. I am willing to use mobile payment as a usual payment tool.<br>4. Overall, I am willing to use mobile payment.                  |

### 4.3 Tests of the Measurement Model

Confirmatory factor analysis (CFA) is a measurement model used to identify the existence of facets and the application of facet development theory [3]. There are two methods to analyze construct validity: convergent validity and discriminant validity. The convergent validity of the measurement model was evaluated according to the three criteria recommended by [67]:

- (1) The factor loading of each item in the same facet needs to exceed 0.5.
- (2) The composite reliability (CR) of the facet needs to exceed 0.7.
- (3) The Average Variance Extracted (AVE) of the facet needs to exceed 0.5.

The AVE and factor loading values of this study are in line with the recommendations of researchers, demonstrating that the measurement model of this study has sufficient convergence validity. Analysis results are summarized in Table 5.

Table 5: Statistics of construct items

|   | Items                   | FL                               | CR    | AVE   | $\alpha$ |
|---|-------------------------|----------------------------------|-------|-------|----------|
| Perceived Trouble (PT)                            | PT1<br>PT2<br>PT3       | 0.771<br>0.824<br>0.809          | 0.844 | 0.643 | 0.909    |
| Perceived No Record for transaction (PNR)         | PNR1<br>PNR2<br>PNR3    | 0.914<br>0.913<br>0.885          | 0.931 | 0.817 | 0.920    |
| Difficulty of paying large amounts in cash (DPLA) | DPLA1<br>DPLA2<br>DPLA3 | 0.788<br>0.857<br>0.848          | 0.870 | 0.691 | 0.945    |
| Perceived Convenience (PC)                        | PC1<br>PC2<br>PC3       | 0.719<br>0.766<br>0.558          | 0.725 | 0.5   | 0.864    |
| Perceived Benefit (PB)                            | PB1<br>PB2<br>PB3       | 0.871<br>0.885<br>0.861          | 0.905 | 0.761 | 0.930    |
| Save Time (ST)                                    | ST1<br>ST2<br>ST3       | 0.811<br>0.887<br>0.873          | 0.893 | 0.736 | 0.956    |
| Habit (Ht)  | Ht1<br>Ht2<br>Ht3       | 0.781<br>0.905<br>0.899          | 0.898 | 0.746 | 0.851    |
| Intention (I)                                     | I1<br>I2<br>I3<br>I4    | 0.838<br>0.819<br>0.797<br>0.815 | 0.891 | 0.672 | 0.940    |

Note: FL (Factor loadings); CR (Composite reliability); AVE (Average variance extracted); SD (Standard deviation);  $\alpha$  (Cronbach's  $\alpha$ )

In terms of discriminant validity, the AVE of the facet itself should be greater than the square of the correlation coefficient of other facets, as suggested by [27]. As shown in Table 6, only one of the correlation coefficient values has a square larger than the AVE of the facet. Therefore, the bootstrap method was used to calculate the 95% confidence interval of the correlation coefficient between the facets. The confidence interval of the correlation coefficient between the facets does not include 1, which indicates the facets in the measurement model of the study are indeed different from each other and confirms that there is discriminant validity in the facets of this study. In summary, the measurement of the model shows good reliability, convergent validity, and discriminant validity.

Table 6: Discriminant validity

| Construct | Correlation coefficient |              |              |              |              |              |              |              |
|-----------|-------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
|           | PT                      | PNR          | DPLA         | PC           | PB           | ST           | Ht           | I            |
| PT        | <b>0.802</b>            |              |              |              |              |              |              |              |
| PNR       | .392**                  | <b>0.904</b> |              |              |              |              |              |              |
| DPLA      | .642**                  | .325**       | <b>0.832</b> |              |              |              |              |              |
| PC        | .484**                  | .205**       | .549**       | <b>0.687</b> |              |              |              |              |
| PB        | .384**                  | .187**       | .374**       | .528*        | <b>0.872</b> |              |              |              |
| ST        | .416**                  | .161**       | .479**       | .679**       | .426**       | <b>0.858</b> |              |              |
| Ht        | .197**                  | .100*        | .244**       | .238**       | .229**       | .233**       | <b>0.864</b> |              |
| I         | .556**                  | .287**       | .541**       | .685*        | .514**       | .602**       | .259**       | <b>0.820</b> |

\*\*P<0.01 \*p<0.05

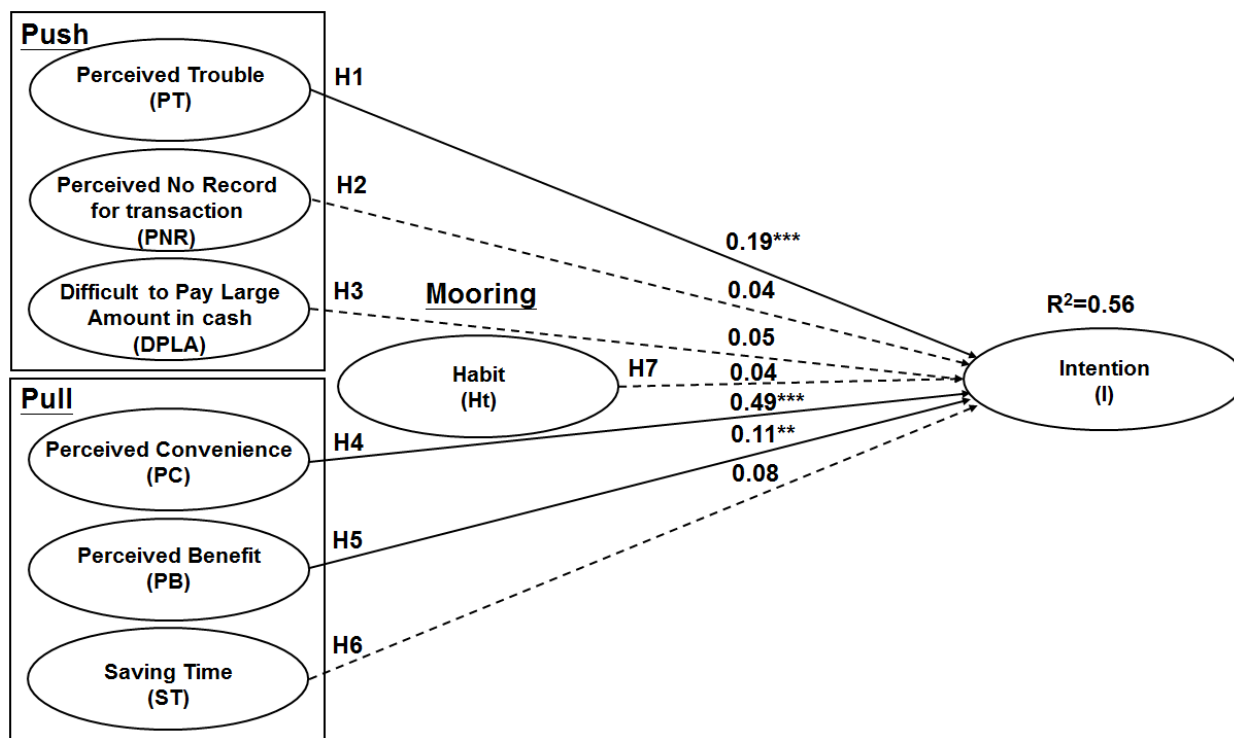
#### 4.4 Results of the Structural Model

Amos 18 was used for testing in the model construction and hypothesis verification sections of this study. According to Schumacker and Lomax [83], the chi-square ( $\chi^2$ ) value of the model should be as small as possible, while the p-value should be greater than 0.05. Since the SEM requires a large sample to execute, the chi-square value increases with the number of samples and the p-value is also correlated with the number of samples. Usually, the p-value is easily significant when there are more than 200 samples [8]. Therefore, Bagozzi and Yi [67] proposed that it is not possible to refer only to the chi-square value. The size of the sample should also be considered. Thus, they recommended using the ratio of the chi-square value to the degree of freedom (i.e., normed chi-square) instead of the chi-square value to test the fit of the model. The ratio was suggested to be between 1 and 5, and preferably less than 3. In this study, the normed chi-square is 2.677, indicating that the fit of the model and the data is within an acceptable range [8].

The goodness of fit index (GFI) represents that a model can explain the ratio of the number of variances and covariates in observed data. This indicator has been the most frequently-reported indicator in SEM analysis. Doll, Xia, and Torkzadeh [22] suggested that 0.8 to 0.9 indicates an acceptable fit and 0.9 or more a good fit. The GFI in this study was 0.910, indicating that the goodness of fit of the model and the data was good. The adjusted goodness of fit index (AGFI) is the GFI adjusted for degrees of freedom. Usually, 0.8 to 0.9 represents an acceptable fit and 0.9 or more a good fit. The AGFI in this study was 0.892, indicating that the fit of the model and the data was within an acceptable range. The root mean square error of approximation (RMSEA) is the difference between the comparative theoretical model and the perfect fit saturation model. The lower the value, the better the model fit. In general, a value of less than 0.05 indicates a good fit, while 0.05 to 0.08 is acceptable. The RMSEA in this study was 0.053, indicating that the fit of the model and the data was within an acceptable range. The smaller the standardized root mean square residual (SRMR) of the model, the better the fit. A value of less than 0.05 is a good fit, while less than 0.08 is acceptable. The SRMR in this study was 0.0546, indicating that the fit of the model and the data was within an acceptable range. The incremental fit index (IFI) is a value-added indicator that is calculated based on the chi-square value of the default model and that of the independent model, usually with 0.9 as the basic threshold. The IFI in this study was 0.949, indicating that the fit was good. The Tucker-Lewis index (TLI), also known as the non-normed fit index (NNFI), is a non-standard fit index similar to NFI, except NNFI considers the complexity of the model. It is often applied as a fit indicator in SEM reports, and 0.9 is usually seen as the basic threshold. In this study, the threshold for NFI and the standardized fit index generally must be over 0.9 (recommended). The comparative fit index (CFI) in this study was 0.955, indicating that the fit was good. CFI reflects the level of difference between the default and the independent model. It also considers the discreteness of the default model and the central chi-square dispersion. Normally, CFI>0.9 is the basic threshold. The CFI in this study was 0.918, indicating that the fit was good. In summary, the fit indicators used on the model are consistent with general principles, indicating that the model fit is within an acceptable range.

The path coefficient among the constructs and the significance of each hypothesis were examined. The results were Perceived trouble ( $\beta = 0.19$ ,  $p < 0.001$ ), Perceived convenience ( $\beta = 0.49$ ,  $p < 0.001$ ), and Perceived benefit ( $\beta = 0.11$ ,  $p < 0.01$ ), thus supporting H1, H4, and H5. Perceived no record for transaction, Difficulty of paying large amounts in cash, Save time, and Habit does not show any obvious influence on intention. Thus, H2, H3, H6, and H4 were not supported (Fig. 2).

We can see the AMOS results for the structural model in Figure 3.



\*\*\*P<0.001 \*\*p<0.01 \*p<0.05

Figure 3: AMOS results for the structural model

#### 4.5 Subgroup Effects of User’s Gender and Age

Previous studies have shown that gender and age as key factors have significant effects on user willingness [60]. For example, demographic variables such as gender and age also affect the consumer satisfaction and the usage rate of mobile wallets [84]. Gender and age are reported to play a pivotal role in regulating SNS addiction in the model [31]. However, age and gender are factors that are sufficient for automatic analysis in e-commerce [26]. Given this context, in this study, it is believed that it is necessary to perform subgroup analysis according to age and gender.

The multi-group analysis is performed of user gratifications, and flow is moderated by the mastery gender of the users. The results are presented in Table 7 and Table 8.

Table 7: Results of gender group analysis

| Group   | Male sample n =311 | Female Sample n =275 |
|---------|--------------------|----------------------|
| $\beta$ |                    |                      |
| PT->I   | 0.16**             | 0.22**               |
| PNR->I  | 0.04               | 0.05                 |
| DPLA->I | 0.16**             | -0.05                |
| PC->I   | 0.51***            | 0.44***              |
| PB->I   | 0.08               | 0.16**               |
| ST->I   | 0.05               | 0.05                 |
| Ht->I   | -0.01              | 0.09                 |

\*\*\*P<0.001 \*\*p<0.01 \*p<0.05 n.s. = nonsignificant.



Table 8: Comparison of average number of each facet in t

| Facet | Male (n = 311) | Female (n =275) | t- value |
|-------|----------------|-----------------|----------|
| Push  | 4.0257         | 3.8829          | 0.026*   |
| Pull  | 4.3609         | 4.3608          | 0.920    |

The Push and Pull above represent t-tests on the overall variable data in the facet.

As age levels differ from gender, we will compare two groups in the sample. According the results show Push is significantly different for males' behavior as opposed to females' behavior. Moreover, the female s' behavior are less likely to have perceived trouble and difficulty paying large amounts in cash. Therefore, for men, it is relatively desirable to abandon cash payment and use mobile payment. Perceived benefit and perceived convenience among women significantly demonstrate that women need discount incentives to be attracted to using mobile payment.

According to Table 9, the results show Push have significant differences between the two groups in each facet. Table 10 shows that push factors (especially perceived trouble) have a more significant impact on individuals' behavior over the age of 30 than those under the age of 30. In addition, the perceived convenience and perceived benefit variables were significant across all age groups' behavior.

Table 9: Comparison of average number of each facet in t-value

| Facet | Below 30 (n =255) | Above 31 (n = 351) | t- value |
|-------|-------------------|--------------------|----------|
| Push  | 3.8175            | 4.1419             | 0.000*** |
| Pull  | 4.3609            | 4.3608             | 0.999    |

The Push and Pull above represent t-tests on the overall variable data in the facet.

Table 10: Results of age group analysis

| Group   | Age above 30 sample n=255 | Age under-including 30 Sample n=351 |
|---------|---------------------------|-------------------------------------|
| B       |                           |                                     |
| PT->I   | 0.32***                   | 0.08                                |
| PNR->I  | 0.05*                     | 0.05*                               |
| DPLA->I | -0.01                     | 0.07                                |
| PC->I   | 0.45***                   | 0.52***                             |
| PB->I   | 0.15**                    | 0.15**                              |
| ST->I   | 0.11                      | 0.04                                |
| Ht->I   | -0.01                     | 0.07                                |

\*\*\*P<0.001 \*\*p<0.01 \*p<0.05 n.s. = nonsignificant.

## 5 Conclusions and Discussion

The overall results of the study show that the influence of pull factors on the willingness to use is relatively higher than that of push factors on human behaviors. This shows that consumers tend to be attracted by the advantages of mobile payment. Consumers may not have abandoned cash payment, but consumers do prefer the benefits of mobile payment.

In the pull facet, perceived convenience and perceived benefit have a significant impact on the consumers' willingness to use on mobile payment. This means consumers feel that mobile payment is indeed more convenient than cash payment and that mobile payment is convenient for cross-border, cross-region, and mutual transfers, making transactions easy to complete. Perceived benefit tends to have a significant incentive for consumers to use mobile payments because it provides additional advantages, benefits, and satisfaction.

The results of this study show that in the push facet, the perceived trouble variable tends to have a significant effect on the change in willingness to switch to mobile payment from cash payment. We can observe that consumers are inclined to perceive cash payment as troublesome. In other words, they hope they can conduct transactions more easily, without having to count bills and change or spend extra effort.

However, the habit variable was overall not significant in the model of this study. This is possibly due to Taiwan having an extraordinarily strong 3C manufacturing industry, universal education and information access, ubiquitous convenience stores and stores selling 3C goods, and consumers with strong self-efficacy. Hence, new ideas and technologies are more widely accepted, and the habitual barrier for mobile payment is low.

The gender analysis results shown in Table 8 illustrate that in terms of converting from cash to mobile payment, males' behavior are more influenced by push factors than females' behavior. In addition, Table 7 shows that males' behavior are significantly prone to the perceived difficulty of paying large amounts in cash, which may indicate that men prefer to purchase high-priced goods such as novel items, models, 3C, and automobiles, instead of daily consumer goods. Therefore, when payment is required, they may feel the inconvenience of having to carry a large amount of cash to pay, a problem that can be solved using mobile payment. Women tend to have a significant propensity for perceived benefit. When promoting mobile payment services to women, providers may need to focus on discount offers. In terms of promotion directed toward men and women, the focus should be the convenience and effortless (trouble-less) applications of mobile payment.

The age analysis results shown in Table 10 reveal that in terms of converting from cash to mobile payment, the perceived lack of transaction records is significantly higher among consumers under the age of 30. This group also tends to have significant perceived convenience and perceived benefit. This is logical as consumers in that age group have been more aware of mobile devices from an early age and tend to prefer convenient and new products. Consumers in this age group have just entered society and have a lower average economic ability. They have a higher price awareness, hence the benefits obtained from mobile payment are a strong incentive. In addition, consumers under the age of 30 (born in the year 1987 to 2018) have been in contact with smartphones for relatively longer (the iPhone was launched in 2008) and are considered native users of mobile applications. Therefore, they can easily recognize the shortcomings of cash payment and the advantages of mobile payment. Generally, those under 30 also tend to not record their transactions themselves. Mobile payment systems (with transaction records) help them track the amounts and frequencies of transactions, which is an incentive for consumers under 30 as they are able to better manage their own finances.

In terms of consumer intentions to switch from cash to mobile payment, consumers over the age of 30 are more likely to have perceived trouble toward cash payment and perceived convenience toward mobile payment. More than half of the consumers over 30 have experienced the industrial, information, and mobile ages, thus they generally recognize the benefits of technology and the continuous advancement of technology. They generally recognize the progress and convenience that technology brings. In addition, the rapid learning abilities of information among Taiwan's under-30s can be applied in the education of technology applications for over-30s at home. Therefore, we may conclude that to promote mobile payment, we must enhance the discount offers to attract under-30s, especially students, and publicize the convenience of mobile payment to target over-30s, at the same time educating them about the applications.

## 5.1 Theoretical Contribution

From a theoretical standpoint, this study makes three contributions to this area of inquiry. The research method of this study is to use qualitative and quantitative methods to extract variables. Under the PPM framework, expert interviews and questionnaires were conducted to obtain the push and pull facet variables. Considering the theories of habit and transaction cost, SEM quantification was used for verification, which is different from normal studies that apply the diffusion of innovations theory [55], [106] or the technology acceptance model [58], [85] for research on intentions. This method was useful for a more comprehensive understanding of the factors that they embrace mobile payment.

Furthermore, mainstream research is limited to the variables in the existing literature. Conversely, the qualitative and quantitative methods used in this study to extract variables, in conjunction with the description from TCT, is one of the distinctions of this study.

This study found that as technology advances rapidly, mobile and cash payment tend to encounter a Habit-fuzzy-&-weak-by-Tech-changeable phenomenon. Lindbladh and Lyttkens [54] found that people with a lower social status are more inclined to rely on their habits, so it is not easy to change their behavior. Logan [56] suggested that self-control is considered to moderate behavior through bio-feedback mechanisms. Habit theory posits that it is more difficult to switch from the original method of usage to a new one. However, as technology progresses, people's average knowledge and information increase too, and their reliance on technology becomes increasingly strong. Consumers with enhanced self-efficacy can choose to accept a new payment method at any time without any difficulty or maintain their original payment method according to their habits. Verplanken and Wood [94] believed that successful habit change interventions involve disrupting old environmental cues and creating new environmental cues. When technology updates are too frequent, multiple environmental cues and methods coexist, and the effect of habits on consumer behavior becomes weak and uncertain.

This study adopted the *Intention to use* as the main purpose of the research and determined the main factors that influence users' behavior regarding mobile payment. Rather than simply studying the *Switch* behavior, this study explored whether the user has the intention to consider using mobile payment when paying in cash in a real-life

scenario. Switch is an event where behavior A is completely converted to behavior B. However, in this study, when adopting behavior A, the intention of adopting behavior B is considered while not necessarily abandoning behavior A. Consequently, this study did not use the definition of Switch to design questionnaires, as in previous studies; this is also a different perspective from previous studies.

Most of related past studies classified the transaction costs as either pre-transaction costs or post-transaction costs according to the work by [24]. Very few studies have tried to explore the topic by combining the transaction cost theory with the PPM model (pull refers to the impact from the positive pulling force and push refers to the impact from the negative pushing force). This study, taking the intention behavior from cash payment to mobile payment as a case study, confirmed that the transaction costs can be classified in terms of positive transaction costs and negative transaction costs after incorporating the PPM theory. Each of these two types of costs is represented by pull or push. This finding is also an important contribution of this study. After considering the transaction costs in mobile payment, we found that push has a much more significant influence on men's behavior compared with women's behavior, while push has a significant impact on people's behavior below 30 years old compared to those above 30 years old. In general, the impact from the pull aspect is more pronounced than that from the push aspect. This behavior results in different performances of push and pull for different gender and age groups.

Therefore, when studying other fields in the future, one can establish a theoretical framework by combining the transaction cost theory with the PPM theory. This framework will provide a new perspective for analyzing the problem.

## 5.2 Managerial Implications

Under the condition with well-established traditional financial mechanisms, the results of this study bring contributions in the following ways:

First, pull factors have a more significant impact than push factors on human behavior, hence in the promotion of mobile payment, the focus should be on the advantages of using mobile payment. This study found that pull factors have a greater impact on consumers' tendency to convert to mobile payment (pull: perceived convenience and perceived benefit; push: only perceived trouble). The study also examined 15 reasons for consumers of disliking cash payment. Out of those options, inconvenience and time-consumption were not voted as the major factors for consumers of disliking cash payment, but these two factors were reflected in the top two factors for consumers to choose mobile payment. We can conclude that consumers tend to disregard the shortcomings of cash payment while being attracted to the advantages of mobile payment. Hence, enhancing the promotion of the advantages of mobile payment would be favored by consumers.

Second, we should focus on the reduction of transaction costs and additional benefits. In this study, perceived trouble, perceived benefit, and perceived convenience were all correlated with transaction costs, and all of them tended to have a significant effect on the conversion of consumer payment behavior. Therefore, when the government or service providers promote mobile payment, they could focus on the incentive of benefits, allowing consumers to feel that using mobile payment is quick and effortless (i.e., the transaction costs are low).

Third, the promotion should target women and over-30 consumers. The sub-group t-tests found that push factors have a significant impact on male consumers and under-30 consumers. Hence, they tend to have a higher motivation for using mobile payment, thus promotion strategies do not need to focus on them.

Fourth, the study found that the conversion of cash to mobile payment was not significantly affected by habits. Basically, when technology changes rapidly, consumers are not necessarily restricted by their habits in terms of using technology. This is especially true in countries with strong self-efficacy, greater choices, and technology that is rapidly changing and widespread. People's tendencies are not necessarily influenced by habits. Taiwan has a dense population, and the urban-rural gap regarding the fast transmission speed of information technology is not large. Technology is accepted very quickly. Thus, the habit factor was not significant in the overall model, indicating that consumers do not reject the conversion to mobile payment because of their previous habit of paying in cash. Also, they do not stop paying in cash despite using mobile payment. Therefore, it may be necessary to implement policies that change environmental cues to motivate consumers to change their payment behavior.

## 5.3 Limitations and Future Research

The limitations of this study are described below. First, the study used quantitative methods to explore the factors affecting the intentions of using payment methods. We distributed online questionnaires to a large and demographically different sample to avoid biased results. However, a single questionnaire may not be enough to fully assess the users' perception of payment, as individual users may have different weights for the various factors that determine intentions, and the survey itself may be subject to self-selection bias [21]. Future research should consider qualitative analysis methods such as increased observations and interviews to better evaluate user perceptions of intentions. Second, the study used a convenient sample from Taiwan, and the results may only be applicable to

Asian cities with a high population density and high penetration of 4G smartphones. This study can be used as a basis for comparison with future studies of similar phenomena in other countries.

This study only considers the consumer's selection intention (demand side) but does not take into consideration the supply side. Future research may address the supply side (mobile payment service providers) to complement this study.

As Taiwan has a universal education system, the population with a higher education level is high (according to the Ministry of the Interior, in 2017, those with a higher education level accounted for 44.5% of Taiwan's over-15 population and this proportion has increased year by year). It also has a high online population and community participation rate, thus the sampling placed emphasis on participants with higher academic qualifications. Moreover, Lindbladh and Lyttkens [54] found that people with lower social status are more inclined to rely on their habits, and it is not easy to change their behavior. Logan [56] suggested that self-control is considered to moderate behavior through bio-feedback mechanisms. Thus, an investigation focused on individuals with high social status or academic qualifications may result in the weakening and ambiguity of the effect of habits. This issue could be improved in future research.

This study only collected samples in the form of questionnaires on the Internet because online questionnaires have several advantages, such as lower implementation costs and faster response rates, as well as without geographic restrictions, over traditional paper-based surveys. Further, we are interested in the demographic groups that use cash payment and have access to the Internet. Based on the previous discussion, the Internet population and web browsing rate in Taiwan are both quite high (90%); hence, this study adopted an online questionnaire survey. Moreover, because *Mobile* payment is a type of online payment, and this study is interested in the behaviors of online users, online questionnaires were used. In the future, the two demographic groups who use cash but with and without Internet access can be compared by distributing questionnaires independently, preparing statistically consistent samples, and analyzing the data with SEM for a more rigorous study.

The conversion from cash to mobile payment is generally slower in developed regions (e.g., Japan, Taiwan), as they changed from cash payment to card payment first. Transitioning to online and mobile payment may require conversion processes and investment. The rapid popularization of mobile payment in Kenya and China is similar to underdeveloped areas skipping PC Internet access and directly embracing mobile Internet access. This study shows that when there is traditional financial progress, and the incentives of new technology are strong and rapidly changing, the influence of the habit factor tends to be vague and weak owing to the availability of multiple choices. However, we have not considered the impact of card payment on mobile payment. This is because Taiwan's smartphone ownership rate is close to 90%, the smartphone has practically become an extra organ for human beings, and credit cards, financial cards, electronic tickets, online banking, online post offices, and telecommunication payments are highly popular. Hence, the difficulty of converting from built-in cards to smartphones or online banking to smartphones is not high. Furthermore, considering that Taiwan residents suffered a negative experience during the credit card debt crisis, this study directly focuses on exploring the switching behavior from cash payment to mobile payment.

This could also be an issue that future studies can consider and improve. The development of mobile payment in Korea is special because the financial crisis in 2008 led to the bankruptcy of the Korean government and disrupted the order of traditional Korean finance. Therefore, in the overall social process of financial innovation, the value of traditional paper money declined, and the transactions were inconvenient and not trustworthy. This prompted Korea to remove the burden of traditional cash payment and create a new environment promoting card and mobile payments. However, in China, the traditional financial infrastructure lagged behind, it is very hard for small and medium enterprises to acquire a loan. There is no personal credit assessment mechanism, and the government only began to set regulations after allowing mobile payment offered by third-party service providers to grow wildly. Therefore, mobile payment has experienced a rapid development in China. Different countries have different developmental strategies and policies for mobile payment, which could also be a consideration in future research.

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