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Building a Research Model for Mobile Wallet Consumer Adoption: The Case of Mobile Suica in Japan

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Abstract

The growth of mobile commerce, or the purchase of services or goods using mobile technology, heavily depends on the availability, reliability, and acceptance of mobile wallet systems. Although several researchers have attempted to create models on the acceptance of such mobile payment systems, no single comprehensive framework has yet emerged. Based upon a broad literature review of mobile technology adoption, a comprehensive model integrating eleven key consumer-related variables affecting the adoption of mobile payment systems is proposed. This model, based on established theoretical underpinnings originally established in the technology acceptance literature, extends existing frameworks by including attractiveness of alternatives and by proposing relationships between the key constructs. Japan is at the forefront of such technology and a number of domestic companies have been effectively developing and marketing mobile wallets for some time. Using this proposed framework, we present the case of the successful adoption of Mobile Suica in Japan, which can serve as a model for the rapid diffusion of such payment systems for other countries where adoption has been unexpectedly slow.

Keywords: Contactless, Mobile payment, Electronic money, Suica, Japan

1 Introduction

The diffusion of technology-based payment solutions hinges on addressing the needs, perceived or real, of consumers whose adoption will determine whether any specific mobile payment system becomes a standard. Japan is at the forefront of such technology and a number of domestic companies have been successfully developing and integrating mobile payments for some time [25].

When asked about the meaning of electronic payments, more people in Japan think of payment systems using value-stored IC cards or mobile phones that they wave in front of dedicated card readers [6]. A recent report by the Japanese Ministry of Internal Affairs and Communications [54] shows that 29.6% of 12,805 respondents possess a contactless electronic money instrument, and among those respondents, 24.2% use a contactless integrated circuit (IC) card and 9.4% use a mobile-phone-based contactless IC card. In addition to a high penetration rate of mobile phones (87%), there are currently 78 million mobile phone subscribers owning a mobile phone equipped with an integrated contactless IC chip [25], and almost 15 million active users of mobile phone-based mobile payment systems (data compiled from [22]-[24], [40]-[42], [70]-[76]). According to the Japan Internet Commission [35], 92.9% of 900 respondents were aware of their mobile phone's capability to make electronic payments, and 23% said they actually used their mobile phone as electronic wallet, also known as Osaifu-Keitai.

A range of new services leveraging mobile networks is spreading rapidly in Japan. In 2009, NTT Docomo and Seven-Eleven Japan started "Kazasu Seikyusyo" (holding your bill in the air), a service allowing people to receive billing statements to their mobile phone mobile wallet application, and then pay their bills at any Seven Eleven convenience store in Japan by holding their over the card readers set up at the counter [67]. Some public transportation operators in the Tokyo area offer parents a service to monitor their children's movements on the transportation network, based on their use of their IC-based transportation pass. Indeed, Japanese children usually start going to school on their own from the age of six and a service such as Tokyu's Kids Security Service, enables parents to receive email notifications to their mobile phone every time their children go through a ticket gate and use their IC pass [77]. Odakyu Railways offers a similar service that caters to the children that use Odakyu Lines with their IC pass [57].

Yasuoka [92] reports that the decrease by 0.04% in the circulation of money announced by the Bank of Japan in 2006, the first time since 1971, can be attributed in part to the increased usage of electronic money. However, the high penetration rate of mobile phones and the existence of a majority of mobile phones capable of making mobile payments [25] cannot alone explain the success of mobile payments. The United States enjoys a similar penetration rate of mobile phones, but that country offers mobile payment systems on a trial basis only, whereas Japan boasts more than 90 million active IC cards or mobile phones engaging in mobile payments for Suica/Pasmo and Euro Dollar Yen (EDY), Japan's two main electronic payment systems.

Given the growing importance of mobile payment systems, the determining factors of their adoption remain unclear. First, although the literature abounds with various models, no single framework has yet emerged on those critical constructs from the consumer's perspective. Second, there are few empirical studies of mobile payment systems, which themselves have not yet taken off outside Japan. The proposed comprehensive model of mobile payment adoption is then illustrated with the case of mobile Suica, the most successful instance of mobile wallet in Japan and arguably the world, drawing on accessible data and existing surveys on mobile payment systems available in Japanese as well as in English before May 2011. To practitioners, this research enables a deeper understanding of how and why consumers are using mobile technologies. It is vital to present relationships between constructs that might impact a consumer's propensity to use the mobile wallet. To academics, this research is based upon a review of established theoretical underpinnings, originally established in the technology acceptance literature.

This paper presents in section two an overview of electronic wallets and mobile payments, with a focus on Japan, which is thus far the only country to have successfully adopted such payment system. Then, section three describes the theoretical underpinnings of technology acceptance, online marketing and shopping, and payment and banking, with a particular focus on empirical studies dealing with mobile technology acceptance, online shopping/mobile commerce, mobile marketing, mobile payment and wallet adoption. Based on the previous review of the relevant literature, section four identifies eleven key constructs for mobile payment adoption from a consumer perspective. Each construct is defined and evaluated in the broader context of mobile commerce and technology adoption, and detailed hypotheses on the relationships between those eleven constructs are proposed drawing upon past research. Next, section five illustrates the proposed integrated framework with the case of Mobile Suica, the most successful mobile wallet to date in Japan and incidentally the world. Last, section five is a discussion of the study's findings, how they contribute to mobile payment adoption research, and how they fit in the broader context of the mobile payment ecosystem which includes all the stakeholders of this relatively new service.

2 Payment Solutions

Japan is thus far the only country to have successfully adopted a mobile payment system with millions of active users. Below is an overview of electronic wallets and mobile payments in the Japanese context.

2.1 Electronic Wallets

Mobile payment instruments fall under the category of electronic money, which “includes all non-cash and non-paper payments instruments such as plastic cards and direct transfer and all money transactions via electronic channels” [69]. Van Hove [86] notes that electronic wallets, although frequently compared to debit cards, should instead be compared to cash. He explains that “the rationale behind their introduction – from the mid 1990s onwards – was indeed to provide consumers and merchants with an electronic payment instrument that could handle small transactions cost effectively [86] p.11. The Committee on Payment and Settlement Systems of the Bank for International Settlements defines an electronic purse or wallet as “a reloadable multipurpose prepaid card which may be used for small retail or other payments instead of coins” [13] p. 22. Unlike debit or credit cards, transactions using an electronic wallet are carried out off-line without the direct involvement of financial intermediaries and the burden of these institutions’ high fixed costs [51]. Current contactless IC card-based payment solutions in Japan fall under this category.

According to a recent survey conducted in 2008, 52% of 1,098 respondents own a contactless IC card with electronic money capability in Japan, and 64% of all contactless IC card holders use the card at least once a week, mainly for public transportation and purchases at convenience stores [34]. From 2008, the introduction of electronic wallet-capable vending machines have led to expansion of electronic money even more [6], and in December 2009, a survey of 1,100 internet users found that 24% of them used a contactless IC chip payment instrument at vending machines [34].

In Japan, every electronic wallet system – such as Suica/Pasmo, EDY, nanaco or WAON – uses Sony’s Felica contactless technology. Nanaco and WAON are contactless electronic wallets provided respectively by Seven & I Holdings and AEON, one of the major retail chains in Japan [1]. Suica/Pasmo and EDY will be treated comprehensively later in this paper. Several recent surveys show that Suica/Pasmo and EDY are the most used electronic wallets in Japan, with 12% to 37% of respondents reporting frequently using at least one of them [6], [34].

2.2 Mobile Payments

Mobile payment is defined as any payment in which a mobile device, such as a mobile phone or any other device capable of connecting to mobile communication networks, is utilized to initiate, authorize, and confirm a commercial transaction [4]. A mobile wallet is a type of electronic wallet which carries out transactions using a mobile device, and the former is an evolution of the latter. For that very reason, both are used concomitantly, as is the case of Japan, and each payment option offers both an electronic and a mobile wallet option to cater to users in different stages of technology adoption (Suica, EDY).

There are currently two main technologies for such mobile payments, short message services (SMS) and near field communications (NFC). In the case of SMS-based payment, the user sends a payment request via an SMS text message to a short code and a premium charge is applied to its phone bill. Such payment system is mostly used for the purchase of digital services such as music and ringtones. Because messages can take time to reach the merchant or can easily get lost, the system is deemed slow and poorly reliable. SMS are virtually non-existing in Japan, for either communication or payment purposes. Instead, most mobile payment systems rely on NFC, whereby the user waves an NFC chip-equipped mobile phone with the relevant application near an NFC reader module to make a transaction. Although they require up-front investment in specially equipped handsets and readers, NFC-based payments are considered fast and reliable. Suica/Pasmo and EDY started as IC card-based solutions and later grew to include mobile-phone applications, effectively expanding from electronic wallet to mobile payment solutions.

NFC allow various types of monetary and non-monetary transactions, involving the exchange of payment information only, both the exchange of payment details and information relevant to the transaction, or transmitting and storing identification information. For those transactions involving only payment information, IC cards or mobile phones are used to transfer payment information for goods and services, such as buying drinks from a vending machine or items at a convenience store. No information other than payment instruction is transmitted in this type of transaction, which makes it well suited for low-value micropayments. Another type of transaction enables to store, process, and exchange information related to the transaction, making it possible for mobile phones to act as tickets, keys or identification. Current applications consist of car park payments and airline check in. In the former, a mobile phone keeps track of the time when the driver entered and exited, thus making paper tickets and parking attendants unnecessary. In the latter, airline passengers identify themselves and carry out the check in process with the ticket information contained in their mobile phone. Furthermore, consumers can use IC card reader/writers to charge their

IC cards with their own computer at home or anywhere with an Internet connection and 19% of surveyed consumers own such card readers/writers with 53% of respondents stating they would like to use those IC card readers/writers [35].

The goal of this paper is not to catalog all available mobile payment services, but rather to explore the drivers of consumer adoption among those systems which have been widely adopted, such as mobile Suica in Japan.

3 Literature Review

The theoretical underpinnings of technology adoption and payment and banking were examined, with a particular focus on empirical studies dealing with mobile technology adoption, mobile commerce, mobile payments and wallet adoption. The literature review specifically addresses the consumer perspective with respect to mobile payment system adoption.

Studying adoption, Venkatesh, et al. [88] explored the variables affecting consumer integration of new information technology innovations. They collectively formed a model called the Unified Theory of Acceptance and Use of Technology (UTAUT) and suggested that individual reactions to using information technology directly affect intentions to use information technology that in turn influences the actual use of information technology. Lu, Yao and Yu [49] suggested that behavioral sciences and individual psychology are strong determinants of adoption of mobile technology. They suggested that while perceived usefulness and perceived ease of use are strong variables in consumer willingness to adopt mobile technology, variables such as personal innovativeness and social influence must also be taken into consideration in determining consumer acceptance. Carlsson, et al. [8] explored the variables concerning adoption rates of mobile devices and services, conducted by testing the applicability of the UTAUT model. They found that variables such as performance expectancy, effort expectancy, and attitude toward using were directly related to behavioral intention.

Lee [47] investigated the impact of perceptions of interactivity on consumer trust and transactions in mobile commerce and concluded that trust does in fact play a significant role in determining consumer transaction intentions. Lin and Wang [48] examined the factors that contributed to customer loyalty in mobile commerce; perceived value and trust were found to be directly related to customer satisfaction and customer loyalty; customer satisfaction was also suggested to positively affect customer loyalty; and habit was proposed to determine customer loyalty. They also found that customer loyalty was directly affected by perceived value, trust, habit, and customer satisfaction. Customer loyalty was evaluated to be a strong determining factor in acceptance of mobile commerce. Pavlou, et al. [61] studied the drivers of consumers to participate in mobile commerce by examining three interrelated behaviors including getting information, giving information, and purchasing with mobile devices. Mobile purchasing involves a satisfying exchange relationship between products/ services offered and the mobile device that uses WAP (Wireless Application Protocol).

Amoroso and Hunsinger [1]-[3] developed a model to better understand the factors that are most important in predicting consumers' behavioral intention to purchase over the Internet. This research expands the original TAM by incorporating additional constructs such as trust, privacy, perceived risk, expectations of Internet information and Web site quality, e-satisfaction, and e-loyalty. This research showed significant relationships with factors including inertia, convenience, perceived value, and e-loyalty all influenced the e-satisfaction construct with respect to mobile applications. Kuo, Wu, and Deng [46] found that service quality positively influences both perceived value and customer satisfaction. Perceived value positively influenced both customer satisfaction and post-purchase intention and that customer satisfaction positively influenced post-purchase intention.

Several studies examined online payments acceptance building the infrastructure for mobile payment applications. He and Mykytyn [31] examined the factors for consumer adoption of online payment systems. They found that a majority of participants favored the concept of online payments with the primary consideration of risk being associated with making online payments. Rigopoulos and Askounis [66] developed a model to examine users' attitude towards adopting online payments and proposed evaluating consumers' adoption of proposed technology finding perceived usefulness, perceived ease of use, and intention to use as all being positively associated with consumers' actual usage of online payments. Luo, Zhang and Shim [50] examined trust and risk perceptions in the adoption stage of the wireless Internet platform, suggesting a research model to suggest factors such as trust, risk, self-efficacy, and performance expectancy which drive the consumer acceptance of mobile banking services. Deng, Lu, and Chen [21] tested a model for online banking acceptance with three new constructs including perceived credibility, SMS usage, and perceived service cost. Neither perceived ease of use, perceived credibility, nor perceived cost was found to have significant effects on user's behavioral attitude toward mobile banking.

The next set of research studied the adoption of mobile payments. Pousttchi and Wiedermann [63] evaluated what key influences affected consumers to use mobile payments and found that subjective security was not a primary driver of mobile payment acceptance. They found that perceived confidentiality of payment details and perceived trustworthiness were strongly correlated. Four key variables were found to directly impacting consumer intention and usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions. Au and Zafar [5] studied the factors that account for patterns of adoption of mobile payments in multiple countries,

suggesting that consumers are not the only determinants of mobile payment acceptance, but also merchants, service providers, and various regulatory bodies – bringing in the concept of the mobile payment ecosystem. The results indicated that the primary factors that affected a country's adoption of the mobile payments included how the stakeholders correlate with each other as well as the conditions of the environment in which such stakeholders operate.

Chen [10] examined which determinants affected consumer use of mobile payments (m-payments). Consumer acceptance was determined by four factors: perceived use, perceived ease of use, perceived risk, and compatibility. The strongest factor to sway consumer acceptance was compatibility. Compatibility refers to the extent to which m-payment is consistent with the prospective user's lifestyle and the way he or she likes to shop. Cheong, Park and Hwang [12] concluded that perceived facilitating conditions were directly related to perceived usefulness and intention to use. However, move-in cost and attractiveness of alternatives were negatively related and facilitating condition was in fact found to be a significant contributor of perceived usefulness and intention to use. Consumers that have little loyalty to credit card companies would possibly be more readily open to switching to mobile payment services. Mallat and Tuunainen [52] looked at the factors affecting merchants' acceptance of mobile payment systems are evaluated and found that the primary adoption drivers that directly affect implementation of mobile payment systems are related to the objective of either increasing sales or reducing costs of payment processing. They suggested barriers of such mobile payment adoption for merchants include complexity of the systems, unfavorable revenue, lack of critical mass, and lack of standardization. They primarily identified primary prerequisites, drivers, and barriers that influence the merchant's adoption of mobile payment systems.

Mbogo [53] studied the various factors that contribute to success with use of mobile payments within micro-businesses in Kenya, concluding that convenience of the money transfer technology plus its accessibility, cost, support and security factors are related to behavioral intention to use and actual usage of the mobile payment services. He concluded that perceived convenience, perceived ease of accessibility, and perceived support had positive direct relationships with the intention to use mobile payment services. Kim, Chan, and Gupta [44] empirically analyzed the adoption of mobile Internet in terms of value to the consumer, suggesting that intention to adopt mobile Internet is directly related to the consumers' perception of the value of mobile Internet, confirming that consumers' perception of the value of mobile Internet is a principal determinant of adoption intention, and the other beliefs are mediated through perceived value. It was found that value perception was a key determinant role in mobile Internet adoption.

Shin [68] examined mobile wallet adoption by using the UTAUT model and proposed four additional constructs of security, trust, social influence, and self-efficacy. He confirmed that familiar factors such as perceived usefulness and ease of use are key determinants toward consumer acceptance and that consumers' attitudes toward accepting mobile wallets are strongly influenced by perceived security and trust. They found that perceived security and trust are key determinants in customer intention to accept mobile wallets, which in turn determines user behavior. The research results also suggested that security and trust are enhanced by social influence.

4 Research Model and Hypotheses

Based on the review of previous models and their supported hypotheses on mobile technology acceptance, online shopping/mobile commerce, mobile marketing, online payments / mobile banking, mobile payment adoption, mobile internet adoption, and mobile wallet adoption, this research retains eleven constructs (Table 1) and proposes the following model as an integrated framework for mobile payment adoption (Figure 1). Several other constructs deemed redundant, such as perceived performance expectancy (similar to perceived usefulness) and perceived credibility (similar to perceived security and privacy), or unsupported in previous studies, such as past experience, were excluded from the framework. The rest of this section describes in detail the relationships depicted in Figure 1; these relationships are then summarized in the forms of hypotheses for mobile payment systems after the review of the relevant literature. The labels H1.1a to H9 are not displayed in Figure 1 for clarity purposes.

4.1 Mobile Consumer Adoption

Mobile consumer adoption involves the consumer's propensity to accept and to assimilate new technologies, specifically a mobile wallet in this instance. Mobile consumer adoption consists of three variables, as derived from the technology acceptance model, to include perceived ease of use, perceived usefulness, and attitude toward using the mobile wallet. These factors of mobile consumer adoption, while separately important, form the basis for a higher-level construct that aggregately measure the consumer's overall tendency to use the mobile wallet in a way that it will find useful.

4.1.1 Perceived Ease of Use of Mobile Wallet

Perceived ease of use is defined as the degree to which an individual believes that using a particular system would be free of physical and mental effort [19] p. 477. Previous studies suggest that perceived ease of use influences usefulness, attitude, intention, and actual use [9]. Davis, et al. [20] found that perceived ease of use directly and indirectly affects usage through its impact on perceived usefulness through the attitude toward using the Internet,

and that perceived ease of use is a significant secondary determinant of people's intentions to use computers. Chau's [9] study also showed that perceived ease of use significantly affected near-term usefulness, but did not significantly affect intention to use. The importance of perceived ease of use increased when an online shopper buys a product online as opposed to just gathering information about a product [29]. Interestingly, Wu and Wang [91] found that perceived ease of use did not significantly affect behavioral intention in a study concerning the acceptance of mobile commerce. He and Mykytyn [31] found a direct relationship between perceived ease of use and both behavioral intention to use and overall satisfaction. Previous works have found that perceived ease of use was positively related to behavioral intention to use [37], [49], [63], [66], perceived usefulness [12], [21], [49], [63], attitude toward using [12], [68], social influence [49], and actual usage [66]. The following hypotheses are therefore formulated:

- *H1.1a. Perceived Ease of Use of Mobile Wallet → Perceived Usefulness of Mobile Wallet*
- *H1.1b. Perceived Ease of Use of Mobile Wallet → Attitude Toward Using Mobile Wallet*
- *H1.1c. Perceived Ease of Use of Mobile Wallet → Behavioral Intention to Use Mobile Wallet*
- *H1.1d. Perceived Ease of Use of Mobile Wallet → Social Influence*

Table 1: Model constructs for mobile wallet adoption

Construct	Definition
Mobile Consumer Adoption	An individual consumer's propensity to accept new technologies and use them in a way that they will find useful [21]
Perceived ease of use	The degree to which an individual believes that using a particular system would be free of physical and mental effort [19] p. 477
Perceived usefulness	The degree to which an individual believes that using a particular system would enhance his or her performance [19] p. 477
Attitude toward using	An individual's positive or negative feeling about performing the target behavior [28]
Facilitating conditions	The belief about the accessibility to resources necessary to facilitate any service [12]
Perceived value	Trade-off between what customers receive, such as quality, benefits, and utilities, and what they sacrifice, such as price, opportunity cost, time, and efforts [15], [16], [43], [94]
Perceived security and privacy	The degree to which a customer believes that using a particular mobile payment procedure will be secure [68], [93]
Social influence	The degree to which an individual perceives that important others believe he or she should use the new system [88]
Trust	The belief that vendors will perform some activity in accordance with customers' expectations [30], [59]
Behavioral intention to use	A measure of the strength of one's intention to perform a specified behavior [28] p. 288
Perceived risk	The subjective belief of suffering a loss in pursuit of a desired outcome [26]
Attractiveness of alternatives	The extent to which [customers perceive] viable competing alternatives are available in the marketplace [38] p. 262

4.1.2 Perceived Usefulness of Mobile Wallet

Perceived usefulness, based on expectancy theory, is concerned with an individual's beliefs in the decision making process [66]. Perceived usefulness is defined as "the degree to which an individual believes that using a particular system would enhance his or her performance" [19] p. 477. The performance expectancy construct, defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" [28] p. 447, was considered redundant by definition with perceived usefulness. Davis, et al. [20] found a stronger and more consistent relationship between perceived usefulness and usage than between other variables reported in prior studies. Individuals evaluated the consequences of their behavior in terms of perceived usefulness and based their choice of behavior on the desirability of the usefulness [9]. Usefulness emerged as the most important factor affecting user acceptance with few exceptions [79]. Szajna [81] found a significant relationship between perceived usefulness and self-report usage in her study of 61 graduate business students, however not hypothesized in her revised TAM. In studying personal computing acceptance in small firms, Sun [79] found perceived usefulness to emerge as the most important factor affecting the constructs related to user acceptance of a variety of technologies. Pikkarainen, et al. [62] found that perceived usefulness was one of the main factors influencing acceptance of online

banking. Carey and Day [7] found a strong relationship between perceived usefulness and attitude. Van der Heijden [85] studied the effects of perceived usefulness compared to a consumer's attitude. They hypothesized that perceived usefulness directly affects a consumer's attitude towards online purchasing. Chen, Gillenson, and Sherrell [11] hypothesized that a consumer's perceived ease of use of a virtual store positively affects his or her attitude towards using the virtual store. They found that higher perceived usefulness does not lead to higher consumer behavioral intent, however, even though other previous studies provided different findings. Previous researchers reported a positive relationship between perceived usefulness and behavioral intention to use [49], [8], [66], [50], [21], [63], [10], [12], [37], [45], perceived ease-of-use [12], [21] [49], [63], attitude toward using [12], [60], [68], facilitating conditions [12], perceived value [44] and actual usage [66]. The following hypotheses are therefore formulated:

- H1.2a. Perceived Usefulness of Mobile Wallet → Attitude Toward Using Mobile Wallet
- H1.2b. Perceived Usefulness of Mobile Wallet → Perceived Value of Mobile Wallet
- H1.2c. Perceived Usefulness of Mobile Wallet → Behavioral Intention to Use Mobile Wallet
- H1.2d. Perceived Usefulness of Mobile Wallet → Actual Usage of Mobile Wallet

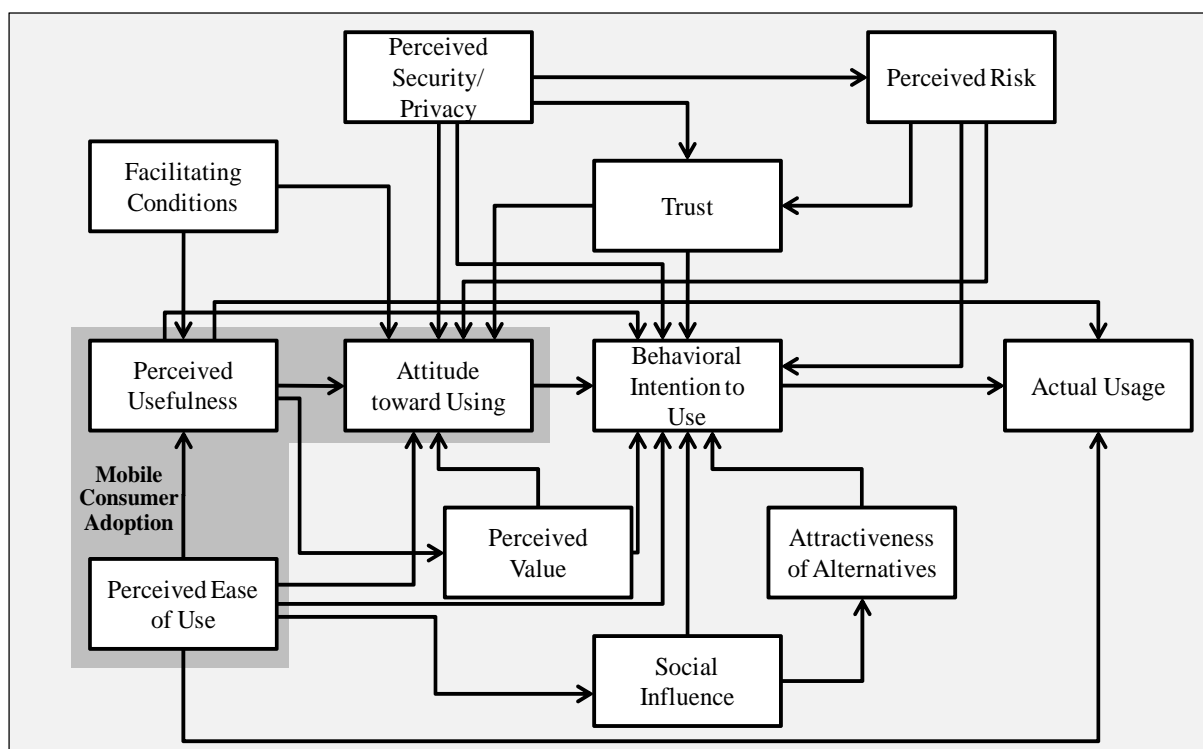


Figure 1: An integrated model of mobile wallet adoption

4.1.3 Attitude Toward Using Mobile Wallet

Attitude toward using is defined as an individual's positive or negative feeling about performing the target behavior [28]. Fishbein and Ajzen [28] have persuasively argued that, in the context of the theory of reasoned action, an individual's actual behavior hinged on that individual's attitude toward that particular behavior. Davis [18] assumed that perceived usefulness and perceived ease of use were major determinants of an individual's attitude toward using technology and, thus, ultimately, were related to actual use. Previous research has found that attitude toward using was positively related to perceived usefulness [12], [21], [68], [60], perceived ease-of-use [12], [21], [49], [68], behavioral intention to use [8], [12], [21], [47], [68], facilitating conditions [12], perceived value [60], trust [47], and perceived security and privacy [60]. In addition, [60] observed that attitude toward using was negatively related to perceived risk. The following hypothesis is therefore formulated:

- H1.3. Attitude toward Using Mobile Wallet → Behavioral Intention to Use Mobile Wallet

4.2 Facilitating Conditions of Mobile Wallet

Facilitating conditions are defined as the belief about the accessibility to resources necessary to facilitate any service [44]. Facilitating conditions, along with behavioral intention to use, are the two direct determinants of usage behavior in the UTAUT [88]. Cheong, Park and Hwang [12] suggest that, in the context of mobile wallet, these resources can be classified into external and internal resources, where the former is embodied in the service network provided by service operators and the latter corresponds to a mobile device connected to the service network and accessed by individuals. Previous research has shown that facilitating conditions were positively related to perceived usefulness and attitude [12], and to actual usage [8]. The following hypotheses are therefore formulated:

- *H2a. Facilitating Conditions of Mobile Wallet → Perceived Usefulness of Mobile Wallet*
- *H2b. Facilitating Conditions of Mobile Wallet → Attitude Toward Using of Mobile Wallet*

4.3 Perceived Value of Mobile Wallet

Perceived value is defined as the trade-off between what customers receive, such as quality, benefits, and utilities, and what they sacrifice, such as price, opportunity cost, transaction cost, time, and efforts [15], [16], [43], [94]. [46] links perceived value to the concept of consumer surplus in economics, expressed as the difference between the highest price that consumers are willing to pay for a product or a service and the amount practically paid. Past research found that perceived value was positively related to customer satisfaction and post-purchase intention in the telecom industry in China [89], and was a primary determinant of adoption intention in mobile commerce in Singapore [44]. Previous literature highlights the positive relationship of perceived value and perceived usefulness [44], attitude [60], and behavioral intention to use [44], [46]. The following hypotheses are therefore formulated:

- *H3a. Perceived Value of Mobile Wallet → Attitude Toward Using Mobile Wallet*
- *H3b. Perceived Value of Mobile Wallet → Behavioral Intention to Use Mobile Wallet*

4.4 Perceived Security and Privacy of Mobile Wallet

Perceived security and privacy are defined as the degree to which a customer believes that using a particular mobile payment procedure will be secure [68], [93]. Perceived security and privacy in mobile wallet are broadly similar to those in electronic commerce. Security concerns involve authentication (data exchanged during the transaction restricted to legitimate users only), confidentiality (data exchanged during the transaction read and understood only by intended users), non-repudiation (participants of the transaction unable to deny their participation in the transaction), and data integrity (accurate data exchanged during the transactions) [78]. Privacy concerns deal with collection (the company collecting too much personal information), unauthorized access (personal information in the database not protected), errors (personal information in the database inaccurate), and secondary use (personal information in the database used for purposes other than the ones the consumer authorized). Information privacy, dealing with the rights of those people whose information is shared [58], can be described as “the claim of individuals, groups, or institutions to determine for themselves when, how, and to what extent information about them is communicated to others” [90] p. 7. The perceived credibility construct, defined as the extent to which a person believes that using m-service will be free of security and privacy threats [89], was considered redundant by definition with perceived security and privacy. Previous results presented evidence of a negative relationship of perceived security and privacy with trust [58], and perceived risk [11], [58], and of a positive relationship with behavioral intention to use [68], and attitude [60]. The following hypotheses are therefore formulated:

- *H4a. Perceived Security and Privacy → Attitude toward Using Mobile Wallet*
- *H4b. Perceived Security and Privacy → Behavioral Intention to Use Mobile Wallet*
- *H4c. Perceived Security and Privacy → Perceived Risk of Mobile Wallet*
- *H4d. Perceived Security and Privacy → Trust in Mobile Wallet*

4.5 Social Influence

Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system [88], also referred to as subjective norm in the UTAUT [87] suggested that such effects could be attributed to compliance in mandatory contexts that causes social influences to have a direct effect on intention; in contrast, social influence in voluntary contexts operates by influencing perceptions about the technology—the mechanisms at play here are internalization and identification. Rhodes' [65] meta-analytic review of

age effects concluded that affiliation needs increase with age, suggesting that older workers are more likely to place increased salience on social influences, with the effect declining with experience [56]. Social influences, or perceived pressures from social networks to make or not to make a certain behavioral decision [49], has been recognized a critical element in innovation diffusion literature [14], [84]. [49] contends that because individuals are generally uncomfortable with uncertainty, they will tend to consult with the social network on their adoption decisions. The UTAUT model elevates social influence as one of the four prescriptive factors of behavioral intention to use [87]. [49] points out that social influence is contingent on the four moderators of gender, age, voluntariness and experience. [37] noted that the fact that TAM does not account for social influence is a limitation. The following hypotheses are therefore formulated:

- *H5a. Social Influence → Behavioral Intention to Use Mobile Wallet*
- *H5b. Social Influence → Attractiveness of Alternatives to Mobile Wallet*

4.6 Trust in Mobile Wallet

Trust is defined as the belief that vendors will perform some activity in accordance with customers' expectations [30], [59]. Building on Jarvenpaa and Tractinsky's [36] observation that trust is especially important in influencing consumer behavior in uncertain environments such as the Internet-based electronic commerce, [47] argues that it is also likely to be a critical factor in mobile payment system adoption. Past research has shown that trust is negatively related to perceived security and privacy and to perceived risk [58], and positively related to behavioral intention to use [47], [50], [68], attitude [47], and perceived usefulness [50]. The following hypothesis is therefore formulated:

- *H6a. Trust in Mobile Wallet → Attitude toward Using Mobile Wallet*
- *H6b. Trust in Mobile Wallet → Behavioral Intention to Use Mobile Wallet*

4.7 Behavioral Intention to Use Mobile Wallet

Behavioral intention is defined as a measure of the strength of one's intention to perform a specified behavior [28] p. 288, and has consistently been found to predict actual usage of a technology [20], [87], [82], [80]. Previous research has shown that behavioral intention to use was negatively related to perceived risk [50], [10], and attractiveness of alternatives [12], and positively related to perceived usefulness [49], [66], [63], [10], [12], [45], perceived ease-of-use [49], [66], [63], [10], [37], social influence [37], attitude toward using [47], [21], [12], perceived value [46], [44], perceived risk [68], trust [47], actual usage [66]. In the literature surveyed here, one study showed that behavioral intention to use correlated with facilitating conditions [12], while two claimed there was no such significant relationship [88], [8]. Because of a lack of unambiguous evidence, the relationship between facilitating conditions and behavioral intention to use will be kept in the model to be tested. The following hypotheses are therefore formulated:

- *H7. Behavioral Intention to Use Mobile Wallet → Actual Usage of Mobile Wallet*

4.8 Perceived Risk of Mobile Wallet

Perceived risk is defined as the subjective belief of suffering a loss in pursuit of a desired outcome [26]. It is especially important as "expectations of negative and harmful consequences if giving information to a mobile seller, thus creating negative attitudes toward giving information to a seller using a mobile device" [60]. Luo, Li, Zhang, and Shim [50] noted that previous studies on Internet banking have mainly focused on transaction security risk or privacy risk. Trust can be helpful in dealing with perceived risk [50], [65]. Previous findings suggest that perceived risk is positively related to perceived security and privacy [10], [58], and negatively related to trust [50], [58], perceived usefulness [50], attitude [60], and behavioral intention to use [50]. The following hypotheses are therefore formulated:

- *H8a. Perceived Risk of Mobile Wallet → Trust in Mobile Wallet*
- *H8b. Perceived Risk of Mobile Wallet → Attitude toward Using Mobile Wallet*
- *H8c. Perceived Risk of Mobile Wallet → Behavioral Intention to Use Mobile Wallet*

4.9 Attractiveness of Mobile Payment Alternatives

Attractiveness of alternatives is defined as the extent to which [customers perceive] viable competing alternatives are available in the marketplace [38] p. 262. In the context of mobile wallet, perceptions regarding reputation, image and service quality determine the attractiveness of alternatives. Because mobile payment solutions are still in their infancy, few alternatives may exist; however, established substitutes with strong network externalities may be a

bigger obstacle to their adoption. Au and Zafar [5] have proposed that mobile payment adoption is affected by the presence of alternative technologies and the presence of bandwagon effects in a particular country. This suggests that attractiveness of alternatives is related to both attitude toward using and social influence. Moreover, Cheong, Park and Hwang [12] found a negative relationship between attractiveness of alternatives and behavioral intention to use. The following hypothesis is therefore formulated:

- *H9. Attractiveness of Mobile Payment Alternatives → Behavioral Intention to Use Mobile Wallet*

5 The Case of Japan: Mobile Suica

The research model was first established based on literature that is not specific to any country in particular. The following case study is specific to Japan and shows the application of the model constructs to the Japanese setting. Japan counts two major mobile payment systems, EDY of Bitwallet, Inc., a joint venture whose main shareholders are Sony and NTT Docomo, and Suica/Pasmo founded by a consortium of transportation companies. The two solutions use Sony's Felica NFC contactless chip technology, which boasts high security, speed, and multiple applications. Besides the electronic wallet application, it can also be used for transportation or access-key purposes. Both systems allow to charge up to 50,000 yen on either an IC card or a Felica chip-equipped mobile phone. EDY, launched in 2001 as the first electronic purse in Japan, had about 63 million prepaid rechargeable contactless smart card customers and 12.5 million mobile customers as of April 2011 [24], [64]. It is currently accepted at 260,000 points of sales (as of April 2011) including popular chains such as am/pm convenience stores, Pronto coffee shops, and Mac Donald's restaurants [24]. In addition to Sony and NTT Docomo, other main shareholders of EDY's operator, BitWallet, Inc., are Japan's largest online shopping mall Rakuten and All Nippon Airways (ANA).

Suica, started by Japan Railways (JR) East in 2001, is a prepaid IC card that could originally be used on the JR East network in the Tokyo metropolitan area and later included other adjacent areas. JR East expanded the IC card's functions from passenger stored-fare tickets to shopping by beginning Suica electronic money services in March 2004, in order to "capitalize on the potential of Suica as a means of settling transactions for small sums" [39] p. 36. Pasmo, ever since its introduction in March 2007 by Tokyo-area private railways, subways, and bus companies, has been interchangeable with Suica. As of January 2011, there were more than 50 million active Suica/Pasmo cards in circulation, of which 95% are equipped with the electronic money function, accepted at about 126,000 points of sales [74], [76]. Suica/Pasmo cards can be used in the greater Tokyo area on the entire transportation network of JR East and those of about 12 private railway and bus operators, as well as on other JR transportation networks in densely-populated areas throughout Japan (Kyushu, Okayama, Hiroshima, Osaka, Nagoya, Shizuoka, Sendai, Niigata, and Sapporo) [72]. As of March 2011, Suica/Pasmo accounted for roughly 1.74 million daily transactions [42]. As of August 2009, 82.8% of residents in the Tokyo metropolitan area used electronic money, with an average monthly transaction amount of ¥6,000 (\$61 to \$65) and an average of seven transactions per month [25]. JR East reported that Suica/Pasmo's electronic wallet function had been used more than 55 million times in July 2010 [73].

In 2004, the main Japanese mobile operator, NTT Docomo, started integrating Sony's Felica RFID contactless chip technology in its mobile phones. It then licensed the technology to rival mobile carriers Softbank and KDDI to spread its penetration and establish it as the de factor standard [25]. As of March 2010, there were about 64 million Felica-equipped mobile handsets in circulations [88] and as of January 2011 there were more than 2.3 million registered active "Mobile Suica" users [75], and as of April 2011 about 12.5 million registered active "osaifu keitai EDY" users (mobile EDY) [24]. The EDY application is also available on any Felica-enabled handset. The mobile applications provided by EDY and Suica offer the same functionalities as the prepaid IC cards they replace (see Table 2).

Suica/Pasmo cards can be recharged at any ticket vending machines found in every station of participating transportation networks. Suica/Pasmo-enabled mobile phones, such as Mobile Suica, are linked to a credit card or bank account, and can further be recharged with cash at select convenience stores. EDY cards and EDY-enabled mobile phones can typically be recharged at the register of participating convenience stores and at dedicated charging machines found on premises of participating retailers. The two systems can only be recharged in 1,000-yen increments, with a ceiling of 20,000 yen for Suica/Pasmo cards, and 25,000 yens for EDY cards. One reason for the success of Suica has to do with the pricing of commuter travel in Japan. Before Suica, when traveling from station A to B, commuters had to refer to a detailed route map to work out the fares to their destinations; fares are calculated based on the number of stations travelled on any given line and commuters had to purchase yet another ticket if traveling on another network during their journey through the Tokyo area. In case commuters had purchased a ticket whose fare insufficiently covered their journey, they had to pay the difference at fare-adjustment machines before exiting through the gates. This option still exists today, favored mostly by elderly or occasional users.

Table 2: Suica/Pasmo and EDY usage as of April 2011

	Card	Mobile	Sub-total	Retail outlets
Suica	*32,410,000	2,300,000	34,710,000	
Pasmo	16,330,000	-	16,330,000	
Sub-total	48,740,000	2,300,000	51,040,000	125,790
EDY	63,000,000	12,500,000	75,500,000	260,000
Total	111,740,000	14,800,000	126,540,000	385,790

(Data compiled from: [42], [24], [74]-[76], [64])

* with e-money capability out of a total of 34,780,000 cards

The Suica rechargeable fare card solved that major hassle of having to calculate the fare of each journey. And since it is now completely interchangeable with the Pasmo card in the greater Tokyo area, it is supported on virtually any train, tramway, and bus system. And because of its stored-fare function, fare settlement is done automatically at the gate when passengers ride a train beyond the area covered by their commuter pass.

5.1 Mobile Suica Consumer Adoption

The case of Mobile Suica is now examined using the proposed model with its eleven constructs identified as central to mobile payment adoption.

5.1.1 Perceived Ease of Use of Mobile Suica

Capitalizing on its transportation application, Suica is a means of payment that users have been carrying and using for several years. The mobile payment capability, Mobile Suica, is a natural extension, whose modus operandi is identical to that of the transportation application, and therefore, does not require physical or mental efforts. Instead of waiting in line at a ticket machine to buy a ticket, passengers can simply touch their Suica card to the automatic fare-collecting gate and pass through immediately (H1.1a). Furthermore, compared to the card-based Suica, passengers can simply recharge their Mobile Suica whenever they need to by accessing the Mobile Suica application on their mobile phone and crediting the desired amount from a bank account or credit card (H1a). And for JR-issued Suica View credit card holders, their Mobile Suica can be recharged automatically by their Suica view credit card whenever their balance reaches a preset minimum amount (H1.1a).

Mobile Suica provides a supportive environment for a positive attitude towards using Mobile Suica (H1.1b), in a country where people associate electronic payment with mobile phones [6]. And Mobile Suica's perceived ease of use, whose modus operandi is similar to that of the transportation card customers have been using for 10 years, has become a requirement for users to even consider using such mobile payment system; consumers will not deem using a means of payment which would be more difficult to use (H1.1c). Last, Sony's Felica technology embedded in younger people's handsets is likely to make these users sensitive to peer-usage of Mobile Suica [68] (H1.1d).

5.1.2 Perceived Usefulness of Mobile Suica

Because Suica originally started as a rechargeable public transportation card solving the issue of calculating the fare for each trip, it immediately appeared as a useful system, generating positive attitude (H1.2a) and strong intention to use (H1.2c), quickly gaining popularity. Dedicated Suica ticket gates acted as incentives towards greater speed and efficiency for commuters (H1.2b). A later improvement added a payment functionality allowing users to purchase goods and services in and around train stations (H1.2b). The steady increase in users over the past five years (H1.2d), more than 2 million to date, suggests that Mobile Suica has been perceived as a useful mobile payment system enhancing the user's performance.

5.1.3 Attitude Toward Using Mobile Suica

Suica cards, having reached more than 50 million when adding interoperable Pasmo cards, have now been successfully used for almost 10 years in Japan, creating positive goodwill towards the service and providing a springboard for the more recent Mobile Suica application. As previously reported, more people in Japan associate electronic payment with mobile phones [6]. As of March 2011, Japan counts more than 123 million mobile phone subscribers in total [83], for a population of roughly 128 million [55], thus making up for a 96% penetration rate. The positive image and pervasiveness of the traditional Suica card, the growing number of mobile Suica subscribers, a high mobile penetration rate, and an association of electronic payment with mobile phone do not necessarily equate a positive attitude towards using Mobile Suica, but provide a supportive environment for such positive attitude towards using that mobile payment system (H1.3).

5.2 Facilitating Conditions for Mobile Suica

The success of Suica originated in part from its no-cost option, whereby the 500 yen necessary to purchase the card are refundable if the user returns his or her Suica card. Cards are available and rechargeable at every station, which

are not only ubiquitous in the Tokyo landscape, but also accessed daily by the majority of the urban population. Dedicated Suica ticket gates acted as incentives towards greater speed and efficiency for commuters.

Similarly, for Mobile Suica, a large number of handsets in circulation today come equipped with the Felica technology. For instance, out of the 54 phones in Docomo's Spring 2011 line up, 32 handsets come equipped with Felica's contactless IC chip. The number of retail outlets accepting Suica is still growing and those are strategically located in or near train stations, which benefit from heavy traffic and captive users who are more likely to be already using Mobile Suica for transportation. At the end of 2010, all three major Japanese mobile phone providers introduced new smart phone models made to handle services particular to Japan, including Suica's mobile wallet function to "challenge models made to universal standards, such as the iPhone" [17]. Therefore, the wide accessibility to Felica-enabled mobile phones and retail outlets accepting Suica create strong facilitating conditions for Mobile Suica. The availability of both Felica-enabled handsets and dedicated ticket gates and points of sale contributed to Mobile Suica's perceived usefulness (H2a) and to a positive attitude toward using the system (H2b).

5.3 Perceived Value of Mobile Suica

Suica started out as a simple contactless fare payment system, whose usage and balance are displayed every time the user goes through the ticket gate. Moreover, the same information as well as a complete historic of all transactions can be displayed and printed at any ticket machine in any train station. Mobile Suica offers the same information on the mobile phone's display available anytime and anywhere. In addition, Mobile Suica offers the possibility to be recharged anytime and anywhere. Although Mobile Suica was originally free, it now costs 1,000 yen a year to use the service. This change has not deterred users who have experienced Mobile Suica's perceived value and who therefore continue using the service for a fee. Moreover, Japanese people can get by riding the train system and making purchases by just carrying their mobile phone. The many perceived benefits offered by Mobile Suica together with the low yearly cost contribute to positive attitude toward using (H3a) and reinforce behavioral intention to use (H3b).

5.4 Perceived Security and Privacy of Mobile Suica

To date, there has been no report in Japan of compromised security of the system, contributing to high perceived security and privacy among the public. The set limited amount that can be charged on Mobile Suica and the required pin code to recharge it provide both security against theft and privacy. In addition, most handsets are equipped with a 'remote lock' function that disables the phone's Felica mobile payment feature by calling a dedicated network customer service number; even if the mobile phone is outside the service area when the user applies to have it locked, the handset will be locked automatically if it re-enters the service area within one year.

Mobile Suica, using Sony Felica's contactless IC technology contains many layers of security, making it nearly impossible for someone to counterfeit and use it. Furthermore, the Felica technology has been certified under ISO/IEC15408 EAL4, an international standard for security evaluation. Last, in addition to its standard privacy policy, Mobile Suica's limited RFID range of operation guarantees that it can only be used deliberately by waving in close proximity of a payment terminal, thus guaranteeing a certain degree of privacy. The perceived security and privacy of Mobile Suica contribute to positive attitude toward using (H4a), behavioral intention to use (H4b), low perceived risk (H4c), and high trust (H4d).

5.5 Social Influence for Mobile Suica

When launched, Suica was heavily promoted in and around train stations, with commercials featuring idols and singers popular with both younger and older crowds. From its inception, Suica has been featuring a penguin mascot appearing in every commercial, and usually interacting with particular Suica users or potential users of all ages. Mobile Suica ads also use Suica's penguin holding a mobile phone. Recent advertisement campaigns promoting Mobile Suica appeal to the specifically Japanese frugality and attention to waste, pointing out that most mobile phones support the Mobile Suica application, not using it amounts to an inefficient behavior in the sense it is a waste not to take advantage of that functionality.

Beyond advertising, previous research has found that "users tend to voluntarily spread word of their experiences to peers, who may be reassured by their mobile buddies regarding possible benefits and risks with mobile wallets" [68] p. 1351 (H5a, H5b); it is important to observe that social influence in using mobile wallets was stronger for younger than older people, and that gender was not a differentiator [68]. As Mobile Suica is relatively new and Sony's Felica technology is a feature likely to equip younger people's handsets who tend to carry newer models, younger urbanite commuters, who make up a sizable number of the Tokyo area, are likely to be sensitive to peer-usage of Mobile Suica (H5a, H5b).

5.6 Trust in Mobile Suica

On the issue of trust using a new payment system, the credibility of the issuer and the confidence of potential users are of prime importance. As for Mobile Suica, JR East has considerable positive brand recognition in Japan, stemming from the fact that the company is a former state monopoly that is today the largest passenger railway company in the world. The Japanese, who are culturally risk averse as demonstrated by their ranking highest in terms of uncertainty avoidance [32], do not like change and therefore perceive JR East's dominant position positively (H6a). Moreover, Mobile Suica builds on the remarkable success of Suica and a technology that has become ubiquitous for most users, thus spreading the belief that mobile wallet using Mobile Suica will perform according to clear expectations (H6b).

Furthermore, in the transportation industry, "the congestion rate is arguably over-emphasized as a service index" [33], and both Suica and Mobile Suica, due to their faster payment processing times compared to other forms of payment, can therefore contribute to convey a perception of higher service and trust.

5.7 Behavioral Intention to Use Mobile Suica

Although there is no specific survey on consumers' intention to use Mobile Suica, recent data shows that a high percentage of Japanese people possesses a contactless electronic money instrument, that most mobile phone subscribers own a mobile phone equipped with an integrated contactless IC chip [6], and that most are aware of their mobile phone's capability to make mobile payments [35]. Behavioral intention can be considered as an individual's underlying attitude, which ultimately determines behavioral intentions to use the mobile wallet [28] (H7). Commuters were quick to adopt the original Suica/Pasmo card's electronic wallet function card, which was reportedly used more than 55 million times in the month of July 2010 alone [73]. This and the fact that a quarter of surveyed respondents are already using mobile wallets [35] suggest that Japanese consumers have a positive underlying attitude toward using Mobile Suica, itself supporting a strong intention to use it.

5.8 Perceived Risk of Mobile Suica

In the pursuit of the stated outcome of travelling on the rail network and paying for small purchases during the journey, the 10-year running utilization of card-based Suica has built up the reliability and safety of the Suica brand. Moreover, Mobile Suica offers many more functionalities than the old magnetic-stripe ticket and the card-based Suica, and its rather limited amount stored (20,000 yen maximum) mitigates any potential loss, thus contributing to very low perceived risk, thereby creating trust (H8a), and inducing positive attitude (H8b) and strong intention to use Mobile Suica (H8c).

5.9 Attractiveness of Mobile Suica Alternatives

The only alternative to Mobile Suica for transportation is the magnetic-stripe ticket or the card-based Suica. As explained previously, Mobile Suica offers many more benefits for similar or lower perceived risk. The real issue resides in the existence of several alternatives to Mobile Suica as a means of payment either in the form of a card-based or mobile phone-based electronic wallet. In this area, Mobile Suica competes directly with cash and credit cards, but not alternative electronic or mobile payment systems such as rival EDY. Historically, because JR has owned real estate in and around train stations, it has pressured store tenants to accept Suica as a means of payment and limited the acceptance of EDY. Also, credit cards are usually not accepted for small payments in Japan, leaving the door open for Mobile Suica. And because the majority of the Tokyo population holds a Suica card or Mobile Suica for transportation purposes, it effectively locks in customers and creates switching costs for payment alternatives (H9).

6 Final Discussion and Concluding Remarks

Drawing on a broad literature review of mobile technology adoption, a comprehensive model integrating consumer-related variables affecting the adoption of mobile payment systems has been proposed. These eleven variables include perceived ease of use, perceived usefulness, facilitating conditions, attitude toward using, perceived value, perceived security and privacy, social influence, trust, behavioral intention to use, perceived risk, and attractiveness of alternatives in the context of mobile payments.

The Japanese case is all the more relevant as mobile wallets, other mobile payment systems, or a defacto standard have failed to spread in other developed nations, although a number of electronic wallets are already in use. The case of Mobile Suica in Japan illustrates this framework and can serve as an example of successful adoption of mobile payment technology for other countries displaying similar consumer characteristics. Practitioners must carefully examine which consumer features are critical in their market, and assess how consumer needs and expectations significantly differ from this model and the Japanese case. The transition from electronic wallet to

mobile wallet requires the cooperation of all the stakeholders involved in the mobile service. Consequently, the success of mobile payments and mobile wallets largely depends on considering the mobile industry from an ecosystem perspective, where consumers represent only one actor, albeit crucial, and merchants, mobile payment providers, technology providers, financial institutions, and the role of government must equally be taken into account. Therefore, as with the case of new technology, the adoption of mobile wallets will only spread when one or several stakeholders create favorable conditions, often in congruence with one another.

The diffusion of technology-based payment solutions hinges on addressing the needs, perceived or real, of consumers whose adoption will determine whether any specific mobile payment system becomes a standard. Japan is at the forefront of such technology and a number of domestic companies have been successfully developing and integrating mobile payments for some time. To practitioners, this research enables the understanding of how and why consumers are using mobile technologies. It is vital to present relationships between constructs that might impact a consumer's propensity to use the mobile wallet. To academics, this research is based upon established theoretical underpinnings, originally established in the technology acceptance literature. Although most of these constructs have been well researched, this model extends existing frameworks by including attractiveness of alternatives and by proposing relationships between the key constructs. Studying the relationships between constructs helps explain the variance in variables that are being studied in other technological contexts, such as behavioral intention to use, perceived value, and actual usage.

In future research, we intend to examine the entire mobile payment ecosystem in order to gain a meta-understanding of the key players, business model, and interaction. The mobile ecosystem has many players, including handset manufacturers, e-wallet payment systems, carriers, infrastructure providers, application developers and content developers. Industry ecosystems differ by country and by technology and the comparison may be useful to understanding mobile wallet adoption. This conceptual model will be followed by questionnaire surveys conducted in the United States, France and Japan to empirically test the hypotheses put forth in this framework. We intend to collect data from 250 respondents in each country to compare adoption rates, application utilization, and variable interactions within the developed model. By highlighting the key factors of mobile payment adoption and potential differences between the three countries, American and European practitioners will be able to identify shortcomings in their potential consumer's perceptions, adjust their offering and mobile payment marketing, and eventually increase the adoption of mobile payment systems.

We also believe that cultural factors play an important role in the adoption of the mobile wallet. In Japan, there is a technology push culture, where large organizations in the ecosystem, such as NTT Docomo and Sony, form relationships with university labs to develop innovative technology advances. Once developed, these technologies are introduced into mobile devices and consumers use these innovations. Decisions are made at the corporate level and technology investment is made based upon projected societal benefits. Whereas in the United States, there is a technology pull culture where consumers demand mobile applications, and if that demand is significant enough and is estimated to yield a reasonable profit, organizational players in the ecosystem make the investment. Even though there is a significant degree of innovative activity in the mobile ecosystem, especially in the application development environment for apple iphone and android operating systems, applications are diffused very slowly and in small doses in the United States. We intend to study this phenomenon in future research by conducting qualitative case studies of key organizations in the ecosystem. In conclusion, this study provides a foundation and infrastructure for understanding the mobile payment ecosystem. The present consumer perspective will subsequently be enriched by data pertaining to the viewpoints of all other actors in the ecosystems.

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