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# MOBILE PAYMENT ADOPTION: AN EMPIRICAL REVIEW AND OPPORTUNITIES FOR FUTURE RESEARCH

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## ABSTRACT

It has been suggested that mobile payment adoption in countries with strong financial infrastructures lag behind countries with weaker financial infrastructures because consumers have more choices of payment methods in strong financial infrastructure countries. Many researchers have attempted to determine the factors that influence the consumer adoption of mobile payment systems for the past decade. This paper reviews previous research that focuses on consumer mobile payment adoption and highlights the primary models used in these investigations. We identified 57 studies that matched our search criteria and found that TAM and UTAUT/UTAUT2 were the primary models utilized. We propose the use a risk/trust valence framework with security and privacy antecedents as a new way of investigating mobile payment adoption.

## Keywords

Mobile payment, risk, trust, valence framework, empirical review

## INTRODUCTION

Mobile payments can occur in a variety of manners, such as paying at restaurants with a smartphone, swiping a credit card on a vendor's tablet, and transferring money to a friend without having to use cash (Pinola, 2018). Mobile payment is defined as a cashless payment, primarily used on smartphones, tablets, fitness trackers, smartwatches, and smart rings (Infineon, n.d.). Examples of popular mobile payment systems include Apple Pay, Google Pay, Samsung Pay, and PayPal, in addition to many others (Viswanathan, 2018). This research distinguishes mobile payment from mobile banking, where mobile banking is used to pay bills through a bank's website or app. If a bank's app also uses the technology discussed next, then it can also be considered a mobile payment app.

There are multiple technologies that mobile payment systems may use, such as near-field communication (NFC) payments, magnetic security transmission (MST) payments, quick response (QR) code payments, and short message service (SMS) based payments (Sorensen, 2018). NFC works with an NFC chip in the personal device and an NFC reader in the point-of-sale (POS) system (Cipriani, 2015). MST works by sending encrypted data through a magnetic signal to the POS swipe card reader, essentially mimicking the swipe of a credit card (Cipriani, 2015). MST and NFC are both currently available with Samsung Pay, but MST is not available on Apple Pay, Google Pay, or PayPal. Both NFC and MST need the personal device to be within a few inches of the POS in order to work, but devices do not need to touch the POS. QR payments work by scanning the merchant's bank-issued QR code with a personal device and entering the payment amount and personal identification number (PIN) (American Express, n.d.). QR is gaining popularity because merchants only need to print their QR code and not invest in expensive technology (American Express, n.d.). SMS based payments work by entering the correct information into a text message and sending it to a vendor specific number (Cipriani, 2015). SMS payments began losing popularity as other technologies became more prevalent on smartphones (Cipriani, 2015).

The popularity of mobile payment has been increasing worldwide, however, the adoption rates in the United States and Canada are relatively low. The United States' adoption rate is 17%, Canada is 14%, but Mexico is 38% (Aite, 2017). The Asia-Pacific region has higher adoption rates, such as 56% in India and 51% in Thailand (Aite, 2017). Europe, the Middle East, and Africa also have higher rates of adoption. For example, Spain has a 25% adoption rate, Italy 24%, UAE 38%, and South Africa has 23% (Aite, 2017). Aite (2017) reports that adoption rates are higher in countries that lack other electronic payment options,

such as credit cards. In contrast, adoption rates are lower in countries, like the U.S. and Canada, where consumer have a strong financial infrastructure and strong credit card options.

The purpose of this paper is to review previous research that has investigated the adoption of mobile payment systems and to highlight the primary research models employed in these investigations. Furthermore, this paper identifies opportunities for future research in mobile payment systems and suggests that studies be conducted from an alternate angle so as to help increase mobile payment adoption rates in countries with strong financial infrastructures.

The remainder of this paper is organized as follows. The next section outlines the methodology used to search for mobile payment research. The section after that summarizes the findings and reviews the primary models used. After the literature summary, we discuss our suggested use of a risk/trust valence framework. The following section reviews studies that included risk, trust, security, or privacy in comparison to our suggested framework. We then conclude the paper in the final section and include contributions and limitations.

## **METHODOLOGY**

We searched for mobile payment adoption research in popular databases and conferences up to fall 2018. Over 100 journal/conference databases were searched that included popular databases such as ProQuest Direct, EBSCO, Science Direct, IEEE Xplore, ACM Digital Library, AIS eLibrary, Web of Science, and Google Scholar. We started with the search terms “mobile payment,” “mobile payment adoption,” and “mobile wallet.” Papers were reviewed and new search terms were developed based on any terms found in the research, such as “NFC payment.” Research reference sections were also reviewed to find additional mobile payment research. Each study was reviewed and only studies where the primary focus was mobile payment adoption were accepted. There were many rejected papers that investigated mobile payment, but not mobile payment adoption.

## **RESULTS AND FINDINGS**

Prior to our research, two other studies were found that investigated previous mobile payment research, however, these were more general in nature. Dahlberg et al (2008) reviewed all of the mobile payment research between 1999 and 2006. They found 73 studies that involved mobile payment in some way, however their study did not focus specifically on the adoption of mobile payments. In fact, a major limitation of previous research is that “technology adoption has been researched with theoretical constructs designed to describe job performance improvements in organizational contexts (Dahlberg and OOrni, 2007).” These theoretical constructs do not necessarily translate effectively when evaluating the adoption of (mobile) technology for personal use. Years later, Dahlberg, Guo, and Ondrus (2015) followed up on the previous study by investigating 188 new mobile payment studies between 2007 and 2014. Again, they included all research and did not narrow their focus to the adoption of mobile payments.

In our evaluation of the extant literature, we focused specifically on investigations into mobile payment adoption. We highlighted the primary research models used in each of the previous studies. We found 61 research articles that investigated factors that influence consumer’s adoption of mobile payment services. Two of the studies were removed because they appeared to be the same study published in a conference and two journals, thus only counted once. Two other manuscripts did not use a model or test hypotheses in determining adoption factors. After removing these studies, 57 research papers were found that used various models to determine factors that influence consumer’s adoption of mobile payment systems. A total of 13 different models were used; the top five of these models are listed in Table 1 below.

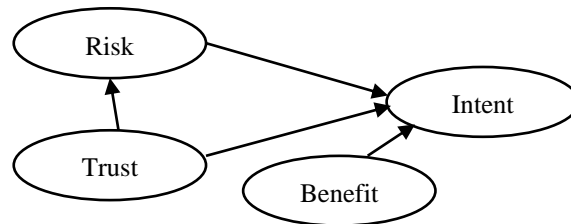
The models listed in Table 1 were often combined by researchers in their studies, forming hybrid models. For instance, eight studies combined TAM and UTAUT. Thus, our table counts those studies as eight TAM occurrences and eight UTAUT occurrences. Overall, the TAM and UTAUT/UTAUT2 models were the dominant models used by researchers. We found that 65% of mobile payment adoption research used TAM and 40% used UTAUT or UTAUT2. In fact, our research found that since 2014, researchers are still primarily using TAM and UTAUT/UTAUT2. We found 29 new mobile payment adoption studies since the Dahlberg, Guo, and Ondrus (2015) summary. Of those 29, 59% used TAM and 38% used UTAUT or UTAUT2. Dahlberg, Guo, and Ondrus (2015) suggested that researchers needed to strengthen their theoretical basis for research and move away from TAM and UTAUT, but that has not happened.

Model	Occurrences	Percentage
Technology Acceptance Model (TAM)	37	65%
Unified Theory of Acceptance and Use of Technology (UTAUT/UTAUT2)	23	40%
Diffusion of Innovation Theory (DOI)	8	14%
Theory of Reasoned Action (TRA)	6	11%
Theory of Planned Behavior (TPB)	4	7%

**Table 1. Primary Models Used in Mobile Payment Research**

**OPPORTUNITIES FOR FUTURE RESEARCH: RISK/TRUST VALENCE FRAMEWORK**

In our investigation of mobile payment adoption, we concentrate on identifying the factors that lead to use at a personal level, and not just within an organizational context. While there has existed a clear dominance of TAM and UTAUT/UTAUT2 in previous mobile payment research, we propose that a valence framework may better help explain the adoption of the technology outside of the organizational perspective and focus more determinedly on the personal use perspective. Specifically, we propose the use of a risk/trust-based valence framework, as introduced by Lee, Ferrin, and Rao (2008), and shown in Figure 1. The

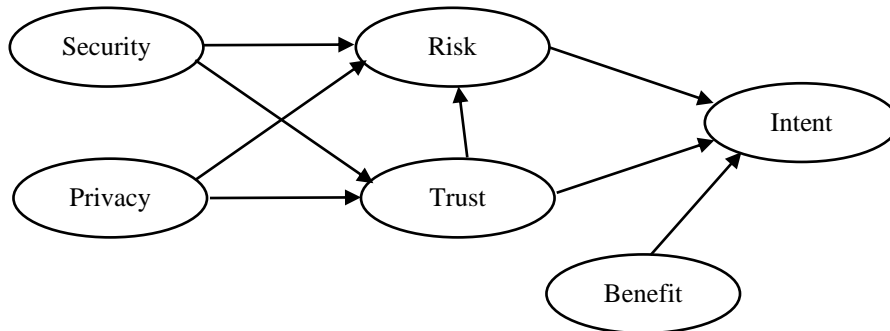


**Figure 1. Risk/Trust Valence Framework (Kim, Ferrin, & Rao, 2008)**

valence part of the framework is the inclusion of both risk and benefit, where users perceive both positive and negative attributes in making a decision (Lee, Ferrin, and Rao, 2008). Another limitation of previous research is the absence or misuse of the antecedents, security and privacy. We propose adding these antecedents to the risk/trust valence framework as separate antecedents, as described by Chin, Harris and Brookshire (2018). We believe this risk/trust valence framework with security and privacy antecedents may provide interesting insights in mobile payment adoption from a personal use perspective. Furthermore, this framework may be adapted to include additional antecedents, as supported by the research.

**Risk, Trust, Security, and Privacy in Research**

While no prior research was found that used the risk/trust valence framework as described above, multiple studies used some of these components. These studies will be reviewed in this section.



**Figure 2. Risk/Trust Valence Framework with Security and Privacy Antecedents**

Overall, two studies used a valence framework. Of these, the one that is the most similar to our proposed framework is a valence framework using the Diffusion of Innovation Theory by Lu et al. (2011). Their model included the components of the valence framework described above, but it did not include the security and privacy antecedents. Lu et al. (2011) found significant relationships between all of the valence framework components with trust being stronger than risk. The other valence framework study, Guo and Waechter (2017), was a TAM hybrid model that only included trust. It was not a risk/trust model and did not include security or privacy.

We found another study that included relationships between risk, trust, and intent, but did not have benefit, thus was not a valence framework. The study from Sla de et al. (2015) used a risk/trust model that had a relationship between risk, trust, and intent, but the model was a hybrid risk/trust UTAUT model and did not include security and privacy. The authors found that trust did not have a significant relationship with intent, but risk did. There was also a significant negative relationship from trust to risk. Investigating the items used in the survey, the risk items seemed to measure security and privacy. For example, one item stated “I do not feel secure sending sensitive information across RMP systems.” Another stated “I do not feel totally safe providing personal private information over RMP systems.” We suggest that security and privacy should be separate antecedents of risk and trust so the risk items can be more specifically crafted to measure risk, as demonstrated in Chin, Harris, and Brookshire (2018).

In a study by Khalilzadeh, Ozturk, and Bilgihan (2017), the authors investigated risk, trust, and security in a hybrid TAM and UTAUT model that was not a valence model or a risk/trust model as described above. Risk had a significant negative relationship with trust and security, but security was not an antecedent of trust or risk. Security had a significant relationship with intent, but risk and trust had no relationships with intent. TAM and UTAUT were the dominant features of the model and risk, trust, and security were not major components.

In another study using risk and trust, Liébana-Cabanillas et al. (2015) included perceived risk and trust in a TAM hybrid model investigating mobile payment adoption of younger users, but their model did not include a relationship between risk and trust. Both risk and trust had direct relationships with intent and both were found to be significant. Security and privacy were not considered. In an earlier study by Liébana-Cabanillas et al. (2014), the authors’ model again included trust and risk, but the model was an extended TAM model and not a true trust/risk model. Trust was an antecedent of Ease of Use and Attitude, but not Intent. Risk was an antecedent of Attitude and was associated with Intent. Security and privacy were not considered.

In some previous research that did not use risk/trust models, we did find the usage of security and privacy, but some were not used properly. While some antecedents were labeled security or privacy, not all actually measured those concepts. For example, Dewan and Chen (2005) labeled an antecedent “privacy,” but asked respondents to rate mobile payments from “very high risk” to “very little risk.” These items seemed to measure risk more than privacy. In another study by Schierz, Schilke, and Wirtz (2010), the security antecedent also mixed risk and privacy questions together. For example, respondents were asked in one security item about the “risk of abuse of usage information (e.g., names of business partners, payment amount).” This survey item, while labeled security, seems to be asking about privacy as it relates to risk. The same items were used in another study by Liébana-Cabanillas et al. (2015).

In a research study by Zhoa (2011), perceived security to initial trust were investigated, but the model did not include risk. However, the trust and security items in the survey did not ask participants about their opinions with mobile payment in general, but instead asked about the trust and security related to the mobile service provider. This is problematic because people may feel differently about their mobile service provider than they do about their financial institution, their app developer, or mobile payment in general.

In Meharia (2012), security and privacy were measured separately as antecedents of “attitude toward using mobile payment systems.” However, three of the four items for security were actually risk questions, such as “the risk of abuse of billing information.” There was one correct general security question that asked if mobile payment systems were secure for conducting payment transactions. The five items measuring privacy were proper items for measuring that antecedent.

Not all studies listed the items that were used to measure constructs and antecedents. In a study by Shin (2009), the researchers used UTAUT and found that perceived security and trust both had significant positive relationships with intention. The items were not disclosed in the paper, so we do not know if the security items were actually security items and not risk or privacy items.

## CONCLUSION

Countries with strong financial infrastructures, particularly credit card services, tend to have lower adoption rates of mobile payment systems than do countries with weaker financial infrastructures. The purpose of this study was to review the previous research that investigated the adoption of mobile payment systems and to suggest new opportunities to investigate adoption from a different perspective, one which focusses on personal use, a valence framework. If mobile payment adoption is investigated in this manner, then perhaps new factors determining the adoption of mobile payment systems can be determined and utilized to increase adoption rates in strong financial infrastructure countries.

The results of our investigation support the previous research from Dahlberg, Guo, and Ondrus (2015) in that the TAM and UTAUT/UTAU2 models have dominated the investigations into the adoption of mobile payment systems. These models have focused on increasing performance in organizational contexts (Dahlberg and OOrni, 2007). To better investigate mobile payment adoption from a personal use perspective, we propose the use of a risk/trust valence framework with security and privacy antecedents. We believe this path of investigating the adoption of mobile payment systems may provide insight from the consumer perspective instead of from the organizational context.

This research contributes to the information systems discipline by summarizing the previous work in the domain of mobile payment adoption. This summary can be very useful to future researchers in determining what methods have been used before, which may lead to new methods being introduced. Due to manuscript length restrictions, this research is limited in that we were not able to fully describe all studies and their results, discuss the theories and models utilized in more detail, and discuss the abundance of antecedents found.

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