The Impact of Privacy Risk on M-payment Service Adoption

ABSTRACT

M-payment services offer many advantages over traditional payment services. Analyst have predicted explosive growth in this area for years. However, despite the advantages m-payment services offer world-wide adoption has been slow. Recently, Apple announced the availability of Apple-pay, a proximity based m-payment service and this announcement sparked renewed increased interest in m-payment services. However, it is unclear whether this will be enough to trigger large-scale adoption. We propose a study utilizing diffusion of innovation theory as our theoretical foundation to investigate the impact of visibility, compatibility, relative advantage, ease of use, trialability, and results demonstrability on the intention to use m-payment services. In addition, we explore the impact of privacy risk in m-services usage.

INTRODUCTION

M-payment, the use of mobile devices and wireless communication technologies to enable the purchase of goods or services (Kim, Mirusmonov, & Lee, 2010) has many advantages over traditional payment approaches. Beyond the ability to support both online and proximity based transactions, m-payment technologies have numerous direct benefits for both consumers and merchants. Consumers who choose to engage in the use of m-payments enjoy a purchasing mechanism which is fast, secure, and convenient. While for merchants, m-payment services hold the promise of increased transaction volumes, reduced transaction costs, and increased customer loyalty (Slade, Williams, & Dwivedi, 2013).

Despite the convenience and added security provided by m-payments services, its world-wide adoption has been slow. While some areas in Asia have seen these systems start to take hold, Europe and especially the United States have experienced much lower adoption rates. While many analysts point to the rapid adoption of smartphones as being an indicator of coming m-payment service adoption, research has shown that this may not be a good determinant of mobile service adoption (e.g., Kristoffersen, 2008). Less than 25% of adult smartphone users download applications regularly and few smartphone users actually make use of all available smartphone services (Schierz, Schilke, & Wirtz, 2010; Slade et al., 2013). The explosive growth predicted by many analysts in m-payment services has yet to be realized.

However, the introduction of Apple-pay by Apple Inc. could have a positive impact on m-payment adoption. Recent news suggests that since the announcement of Apple-pay there has been a significant increase, not only in Apple-pay transactions, but in m-payment service usage as a whole (Clover, 2014a, 2014b). However, it is not clear if this positive trend in m-payment adoption will continue and represents a fundamental change in consumer attitudes towards the technology (Anderson, 2014) or whether the increase in usage is a temporary response to the Apple marketing campaign.

BARRIERS TO ADOPTION

There are numerous barriers to m-payment service adoption. First, m-payment services require a complex infrastructure. There are many stakeholders involved in the delivery of m-payment services.

Financial institutions, government regulators, merchants, mobile network operators, device manufacturers, mobile content providers, and consumers all play a role in implementation of m-payment services (Slade et al., 2013). Without the necessary infrastructure and alignment among the various stakeholders, adoption of m-payment services will be difficult.

Another barrier to m-payment service adoption is the wide variety of alternative payment mechanisms that are currently available. Alternatives to m-payment services are familiar to the consumer and have a well-established infrastructure in place. This is especially true in the case of proximity payment services such as credit cards, debit cards, checks, and even cash payment systems, which are well established and entrenched. Furthermore, the introduction of contactless credit cards may serve to further dampen the appeal of m-payment service adoption (Slade et al., 2013).

Security and privacy concerns are also among the factors that impact m-payment service adoption. Even though technology providers tout m-payment services as more secure that traditional payment services (e.g. credit and debit card payments), recent high profile security breaches may have made the consumer wary about adoption and use of m-payment systems. Some of the more recent high profile security breaches include (Cordray, 2014):

- Target Corporation: breaches of payment systems in 2008-09 and again in 2013 resulted in compromise of payment information of over 100 million customer.
- Sony Online Entertainment: 2014 breach of Sony's private network resulted in 102 million user accounts being compromised.
- JP Morgan Chase: hackers gained access in 2014 to personal information associated with 76 million personal accounts and 7 million small business accounts.
- Home Depot: more than 56 million customer credit card and debit card numbers were compromised in the summer of 2014.

While complex infrastructure and widespread availability of alternative payment mechanism are essentially structural barriers to the adoption of m-payment technologies, security and privacy concerns represent an attitudinal, and thus malleable, barrier. The ability to influence such attitudes and thereby increase m-payment use in order to secure its numerous benefits is of direct practical importance to both the vendors of m-payment technologies and merchants which employ such payment approaches. As such, we focus on the impact of security and privacy concerns on consumer adoption of m-payment services.

THEORETICAL FOUNDATION

M-payment research can be divided into three distinct research streams: success and usage of m-payment services, comparisons of different m-payment platforms and technologies, and analysis of business environments in which m-payment systems operate (Slade et al., 2013).

Prior studies regarding m-payment service adoption have built upon classical adoption models such as the technology acceptance model (TAM) (Davis, 1989), the theory of reasoned action (TRA) (Ajzen & Fishbein, 1973), and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Hall, Davis, & Davis, 2003). Such studies have examined a wide variety of factors they such as perceived ease of use (e.g., Kim, Mirusmonov, & Lee, 2010; Shin, 2010), perceived usefulness (e.g., Chen, 2008; Kim et al., 2010), compatibility (e.g., Lu, Yang, Chau, & Cao, 2011; Schierz et al., 2010), social

influence (e.g., Hongxia, Xianhao, & Weidan, 2011; Hung, Yang, & Hsieh, 2012), use context (e.g., Mallat, Rossi, Tuunainen, & Öörni, 2009), trust (e.g., Lu et al., 2011; Shin, 2010), cost (e.g., Hongxia et al., 2011; Lu et al., 2011), and risk (Chen, 2008; Shin, 2010).

The current study employs diffusion of innovation (Rogers, 1995) as a theoretical lens through which to examine m-payment adoption. According to diffusion of innovation theory, individuals' willingness to adopt a new innovation varies based on their personal innovativeness. Rogers (1995) identifies five categories of adopters: innovators, early adopters, early majority, late majority, and laggards. On one other end this spectrum are innovators, who are willing to be the first to try a new technology, are typically well-educated, and acquire information from multiple sources. On the other end of the adoption spectrum are laggards, who tend to wait for others to adopt and are reluctant to try a new innovation until it is fairly well established

Rogers (1995) also identified five factors that impact the rate of innovation adoption. These factors include relative advantage, compatibility, trialability, observability, and complexity. Relative advantage is the degree to which individuals perceive an innovation as better than what was previously available. Compatibility is the degree to which the innovation is consistent with perceived needs and values. Complexity is the perception of how difficult the new innovation is to use. Observability is the degree to which the results or impact of the innovation are visible. Trialability is the ability of the individual to use the innovation prior to adoption. While the first four factors (relative advantage, compatibility, trialability, observability,) positively influence innovation adoption, the fifth factor (complexity) has a negative impact on adoption of an innovation (Rogers, 1995).

IS research on the adoption of new technologies has made significant use of diffusion of innovation theory (Sidorova, Evangelopoulos, Torres, & Johnson, 2013)and, among those that have employed this theoretical lens, Moore and Benbasat (1991) are of particular importance. Their research identified inconsistencies and conflicting results with some of the constructs in diffusion of innovation theory. As a result, the authors expanded the model suggested by Rogers (1995) and validated an instrument consisting of eight factors that impact adoption of information systems. The original diffusion of innovation theory model was amended to include image and voluntariness as additional constructs that influence IT adoption. Image is the impact that the use of the innovation is perceived to have on the individual's social status (Moore and Benbasat 1991). In other words, the use of new technology could actually serve to enhance how the individual is viewed by others within their particular social group. Voluntariness is the degree to which adoption and use of the innovation is perceived as being voluntary (Moore and Benbasat 1991). If a new technology is introduced into an organization and its use by employees is mandatory, then adoption is not a free choice. This mandated usage will have a significant impact on diffusion within that organization regardless of the other perceptions held by the individual users. In addition to the two new constructs, Moore and Benbasat (1991) also drew a distinction between result demonstrability and visibility. Result demonstrability is the ability to communicate to others the results of using the innovation and visibility represents the degree to which the individual observes others using the innovation. Both of these factors positively influence technology adoption and usage.

However, as Moore and Benbasat (1991) point out in their study, it is important to draw a distinction between the perception of the usage of the innovation and characteristics of the innovation itself. In

other words, when considering relative advantage we are concerned with the degree to which the individual perceives usage of the innovation as better than the usage of prior methods. This is quite different than the perception of the innovation as being better than other methods. Similarly, as we introduce the notion of perceived risk, it is important that the notion is viewed as the perception of risk in using the innovation as opposed any characteristic of risk associated with the innovation itself.

RESEARCH MODEL AND PROPOSITIONS

In our study of m-payment service adoption we build upon the diffusion of innovation work by Moore and Benbasat (1991) and use six of their eight factors. Our proposed model is presented in figure 1. These factors include visibility, relative advantage, compatibility, ease of use, results demonstrability, and trialability. Consistent with Moore and Benbasat (1991), we define these factors as follows:

- Visibility: the degree to which the individual has observed others using m-payment services
- Relative Advantage: the perception of the individual that the usage of m-payment services is better than other payment service types.
- Compatibility: the degree to which the perception of usage of m-payment services is compatible with the their needs
- Ease of Use: the perception that m-payment services are easy to use.
- Results Demonstrability: the degree to which the individual perceives that they can communicate the value of m-payment service usage to others
- Trialability: the degree to which the individual has had the opportunity to use and try m-payment services prior to adoption.

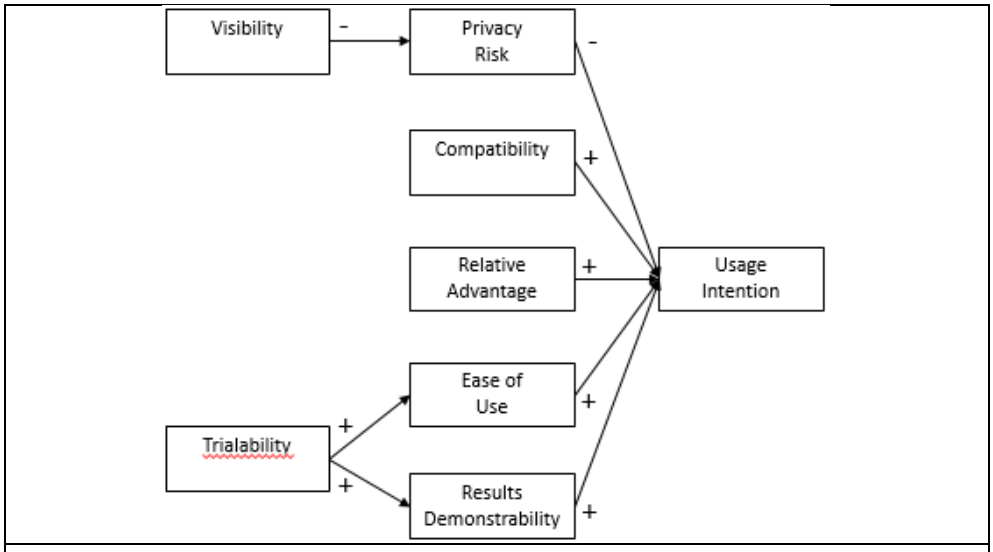

FIGURE 1: Proposed Model

Consistent with diffusion of innovation theory (Rogers, 1995) and the work by Moore and Benbasat (1991), we propose the following:

> *Proposition 1: The perceived compatibility of m-payment systems with the individual's needs will positively impact usage intention.*

Proposition 2: The perception that the usage of m-payment services are better than other payment service types will positively impact usage intention.

Proposition 3: The perception that the usage of m-payment systems are easy to use will positively impact usage intention.

Proposition 4: The degree to which an individuals perceived that they can communicate the value of m-payment service usage to others will positively impact usage intention.

PRIVACY RISK

In addition, in our proposed model, we include the notion of perceived privacy risk. Information privacy refers to the ability of the individual to maintain control of their personal information (Westin, 1967). Several studies have explored the concept of information privacy and the impact of a perceived lack of control over private information (e.g., Dewan & Chen, 2005; Dinev & Hart, 2006; Goodwin, 1991; Laufer et al., 1973; Schierz et al., 2010; Stone et al., 1983; Zhou, 2011). In a study by Dewan and Chen (2005), about half of respondents felt that m-payment services were not secure and believed that using m-payment services put their personal information at risk. Zhou (2011) explored the impact of the perceived security of m-payment transactions on trust and perceived usefulness and found that perception of security transactions positively influences the trust in using m-payment services. Previous research also found that perceived security impacts the individual's attitude toward m-payment service usage (Shierz et al., 2010). Thus, it is worthwhile to explore whether privacy concerns influence m-payment service adoption and if so whether it outdoes the effect of other innovation adoption factors. Therefore, consistent with prior research on m-payment service adoption we propose:

Proposition 5: The perceived privacy risk associated with m-payment service usage will negatively impact usage intention.

VISIBILITY

Visibility is the context of this study is defined as the degree to which the individual has observed others utilizing m-payment services. Prior studies on risk evidence have found that as individuals observe others engaging in risky activities, they are more likely to engage in risky behavior themselves (e.g., Yechiam, Druyan, & Ert, 2008). This is consistent with consumer behavior research that suggests that when individuals witness others using a products, they tend to use the product as well (McFadden & Train, 1996). Extending this into the context of m-payment services, we propose that when individuals observe others successfully utilizing m-payment services, their reluctance and concerns should be reduced. Hence, we propose the following:

Proposition 6: As individuals observe others using m-payment services their privacy risk concerns will be reduced.

TRIALABILITY

As discussed earlier, research suggests that individuals will gain insight about a product (or innovation) by observing others using that product. Such experiences positively impact the attitude of the observer toward using the product (Bhattacherjee & Premkumar, 2004; Bhattacherjee, 2001; McFadden & Train, 1996). A two-stage model by Bhattacherjee and Premkumar's (2004) suggests that using a technology

can impact the individual's attitudes and beliefs toward future intention to use the technology. Therefore consistent with prior research, we propose the following:

> *Proposition 7: The degree to which an individual has the opportunity to use m-payment service prior to adoption will positively impact their ability to communicate the m-payment usage to others.*
>
> *Proposition 8: The degree to which an individual has the opportunity to use m-payment services prior to adoption will positively impact their perception of m-payment service usage ease of use.*

METHODOLOGY

To test the proposed model a questionnaire will be developed and distributed to individuals in the U.S. Individuals will be chosen from two universities in the southwestern United States as well as respondents from the community at large. The target sample will be individuals between 20 and 40 years old who are familiar with smartphone technology.

A search of existing literature will be conducted in order to identify validated items to be used in this study. In particular, we plan to leverage the work done by Moore and Benbasat (1991) for items consistent with diffusion of innovation theory. Prior research that explores the impact of perceived privacy risk on technology adoption will be leveraged to collect validated items for use in the study (e.g., Dewan & Chen, 2005; Dinev & Hart, 2006; Goodwin, 1991; Laufer et al., 1973; Schierz et al., 2010; Stone et al., 1983; Zhou, 2011).

Once gathered, the data will be analyzed using partial least squares structural equation modeling. Details of the instrument will be presented at the conference along with any preliminary results.

CONCLUSION

In summary, this paper details research-in-progress which theorizes about the importance of privacy concerns in the adoption of m-payment technologies. A conceptual model is presented which draws on diffusion of innovation research and situates privacy concern within its nomological net. If supported, this research will contribute to a better understanding of the factors which influence the adoption of m-payment technologies.

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