UNDERSTANDING THE FACTORS DRIVING NFC-ENABLED MOBILE PAYMENT ADOPTION: AN EMPIRICAL INVESTIGATION

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Abstract

Though NFC mobile payment offers both convenience and benefits to consumers, its adoption rate is still very low. This study aims to explore the factors determining consumers’ adoption of NFC mobile payment. In this study, building on TAM, an extended adoption intention model is developed by incorporating three sorts of variables into it, namely mobile payment system factors (compatibility and perceived complementarity), user characteristics (mobile payment knowledge), and a risk-related factor (perceived risk). The model is empirically tested with a sample of 377 validated respondents. Compatibility, perceived ease of use and mobile payment knowledge are found to be the factors determining individuals’ intention to use NFC mobile payment. Against our expectations, perceived usefulness and perceived risk do not affect use intention significantly in adopting NFC mobile payments among consumers. We discuss the theoretical and practical implications of these findings, and point out the limitations and need for future research.

Keywords: Mobile payment, NFC, TAM, IS adoption, behavioural intention, IS acceptance.
1 INTRODUCTION

The advance of information technologies has dramatically altered the payment industry as well as consumers’ behaviour in payment, such as online payment, mobile payment. After the bloom of both card-based payment and online payment, payment industry practitioners have turned their expectations on the future of mobile payment, especially at point-of-sale terminal (POS), replacing cash and separate smartcards as more secure, convenient, and cost-efficient means for transactions. Mobile payment refers to the payment services that are conducted via the use of mobile devices, such as the payments for goods, services, and bills with a mobile device, including mobile phone, smart-phone or personal digital assistant by taking advantage of wireless and other communication technologies (Dahlberg et al. 2008). Recently, mobile commerce has become a new trend in business. As Tan et al. (2014) posit that mobile payment will eventually play an important role to facilitate transactions in mobile, or pervasive commerce.

In the past years, we have witnessed a range of innovative techniques used in mobile paying via short messaging service (SMS), Wireless Application Protocol (WAP), General Packed Radio Service, 3G as examples of carrier-mediated payments versus more direct means at the cashier, or POS, such as Near Field Communication technology, hereafter NFC. Though mobile payment can offer convenience and benefits to consumers and merchants, the adoption of mobile payment has not been and appears not to be ideal compared to the traditional payment methods (Chen et al. 2010).

NFC can be used for payment via a short-range high frequency wireless communication technology in a secure manner. NFC enables transactions to be conducted by holding a mobile device within proximity of NFC reader terminal (typically within 10-20 cm). The transaction can be initiated with a simple touch of the devices, or by gesture at the reader (Chen et al. 2010; Liu et al. 2013; Tan et al. 2014).

As stated earlier, in spite of the convenience and potential benefits, NFC mobile payment adoption is slow among consumers. For example, as ABI research predicted, the total value of NFC mobile payment transactions will increase from 4 billion dollars to 191 billion dollars in 2017 (ABI research 2012). Earlier predictions have been in similar scale, e.g., in 2005 ABI Research predicted that 50% of the mobile phones alone would be equipped with NFC, consequently potentially capable for contactless payments at POS (c.f. Smart Card Alliance, 2005). Against this backdrop, it is interesting to note that prior empirical research on NFC mobile payment is relatively little despite its unfulfilled promise in new means of payment (Tan et al. 2014). In this vein, investigating the factors of consumers’ intention to use NFC mobile payment empirically in real life setting should be of importance for both researchers and practitioners.

To address the above issue, understanding that NFC is in its infancy of adoption, we built our research model from Technology Acceptance Model (TAM). TAM is a well-recognized - some could say a thoroughly tested - model to explain users’ initial acceptance of an IS, or in generic terms, a technology (Davis 1989; Davis et al. 1989; Tan et al. 2012). As indicated in earlier research, the two constructs included in TAM, perceived ease of use and perceived usefulness, cannot explain differences between rates of IS adoption completely (McCoy et al. 2005; Kuo & Yen 2009; Venkatesh & Davis 2000). The earlier research suggests that TAM has neglected the importance of users’ characteristics in predicting their adoption of IS (McCoy et al. 2005; Tan et al. 2014), and also perceived risk, which has been found as one of the major barriers for consumers to adopt finance-related mobile payment services (e.g., Mallat 2007).

We compensate for these acknowledged deficiencies of TAM with additional factors considered relevant in earlier research that we think of importance in determining consumers’ intentions to adopt NFC. As a consequence, we complement the model with two mobile payment system factors, (i.e., perceived complementarity and compatibility, which are crucial for adoption), one user-centric factor (i.e., users’ knowledge about paying mobile) and one factor of risk (perceived risk). Taken together, we postulate in our model that consumers’ intention to adopt NFC for mobile paying will be
determined by their perceptions on NFC (perceived ease of use, perceived usefulness, compatibility and perceived complementarity), but additionally by the consumers’ characteristics (mobile payment knowledge) and potential risks (perceived risk) in using NFC mobile payment. We test the proposed model with a live survey of 377 valid responses collected in a Chinese experiment. None of the research subjects had used NFC mobile payment at the time of the experiment.

This study contributes to IS and technology research as follows: First, our research provides a fresh update into the knowledge on the adoption of mobile payment systems (NFC). Second, this research attempted to build a well-founded operational extension to TAM that can explain individuals’ intentions better. Thirdly, with the revised model we can also cast light on the lagging adoption of NFC (despite its proven benefits).

The remainder of the paper is structured as following: Section 2 presents a brief research background of the current study. We then present the research model and research hypotheses in Section 3, followed by a description of the research design and research results in Section 4, such as research instrument development, data collection, data analysis and research findings. The research findings are presented in Section 5. We highlight the implications for theories and practices in Section 6. Finally, we point out the research limitations and future research directions.

2 RESEARCH BACKGROUND

2.1 Mobile payment technique

From a technical perspective, there are primarily two types of mobile payment approaches: remote and proximity (Becker 2007; Chen 2008). Remote mobile payments can be conducted through the use of SMS or WAP/Internet. SMS-based mobile payment is conducted by sending PIN in SMS to mobile payment service provider. In this approach, the money paid is from a bank account, credit card, debit card or prepaid card that is associated with the mobile phone number (Becker 2007). In WAP/Internet-based mobile payment, consumers use wireless communication to access information, particular Internet content, from a mobile device (Becker 2007). The purchase is typically made via a web browser or the interface of a preinstalled client, with secured connection over a carrier. A key advantage of remote mobile payment is that consumers can make a payment anywhere and anytime with no need of a point-of-sale (POS) terminal – provided there is a network and it is accessible.

Proximity mobile payment, is also called contactless mobile payment (Becker 2007; Chen 2008). Proximity mobile payment is nowadays typically associated to NFC-based mobile payment (Becker 2007; Chen 2008). NFC is a set of close-range wireless communication standards, which is built upon short-range radio-frequency identification (RFID) technology by allowing two-way communication between endpoints. It facilitates consumers to exchange payment information between a consumer’s mobile device and a merchant’s POS terminal through simply touching (It can be contactful, too), or waving the mobile devices close to the terminal (typically under 20 cm) (Becker 2007; Chen 2008), which launches an encrypted near-field ad-hoc network connection. A user may need to input a secure PIN or password to approve the transaction. Some estimates declare that NFC-based mobile payments can be 15 to 30 seconds faster than swiping and signing the receipt or entering a PIN of a smartcard at POS (Hayashi 2012). In some scenarios NFC-technology could be used to identify arriving consumers at the entrance. Therefore, NFC-based mobile payment can facilitate a range of in-store marketing and eServices possibilities.

NFC-based proximity payment has obvious differences to the remote mobile payment. The availability of a POS terminal is a prerequisite for NFC, so it is not ubiquitously enabled as the remote mobile payment. On the other hand, it is not dependent on the availability of a mobile carrier, and it can be used on the spot of the exchange of the goods directly between the parties. Hence, the driving factors behind NFC-based mobile payment adoption are likely to differ from those of remote mobile payment.
2.2 Models of Intentions to Adopt NFC

In the IS literature TAM has been one of the first and the most important research model to explain users’ adoption behaviour. The fundamental premise of the model is that users act rationally in their decision to use an IS. As a consequence it is their perceptions on ease of use and usefulness that are the main determinants for any usage. Perceived ease of use affects IS adoption intention directly and indirectly via perceived usefulness. It has been extended by Venkatesh and Davis (2000) to TAM2 by adding some social and organizational variables to further predict perceived usefulness, such as subjective norms, image, job relevance, output quality and result demonstrability, which determines IS adoption intention together with perceived ease of use. Later Venkatesh and Bala (2008) further extended TAM2 to TAM3 by incorporating the model of the determinants of perceived ease of use, complicating the model further. TAM has also been extended to explore various IS with integration of different variables, such as perceived enjoyment, playfulness, and trust (Gefen et al. 2003; Liu et al. 2011; Wu & Wang 2005) to match the changes of IS use from organizational setting to social environments. As Kim (2010), and earlier Luarn and Lin (2005) argued, TAM continues to be explored and improved in new research in different research contexts. It has become a norm to start with one of the models above, and modify them to the research context.

As an example of such modifications, TAM has been used to investigate individuals’ use of mobile payment. Kim et al. (2010) integrated user characteristics (such as innovativeness and mobile payment knowledge) and mobile payment service characteristics (such as mobility, reachability, compatibility and convenience) into TAM to explore consumers’ adoption of mobile payment in general. Tan et al. (2014) explored consumers’ use of mobile credit card by incorporating psychological constructs (such as social influence and personal innovativeness in IT) and finance-related risks (such as perceived risk and perceived financial cost) into TAM. Liebana-Cabanillas et al. (2014) investigate consumers’ acceptance of SMS mobile payment in virtual social networks by including also trust and risk into their model. Leong et al. (2013) also extended TAM to explore NFC-enabled mobile credit card acceptance. We also build on TAM and use findings from previous research to extend it to fit the context of NFC mobile payment adoption intentions.

3 RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

This study adopts TAM as the basic theoretical framework to explore the factors driving individuals’ adoption of NFC mobile payment as TAM has been a dominant theory in explaining individuals’ adoption of new IS with a growing empirical base in IS research (Gefen et al. 2003; Liu et al. 2011; Wu & Wang 2005; Leong et al. 2013). We extend TAM by incorporating compatibility, perceived complementarity, mobile payment knowledge, and perceived risk.

3.1 TAM based hypotheses

Since the current research employs TAM as the basic research framework, the following hypotheses posited in TAM are also suggested in the present study:

H1: Perceived ease of use positively relates to intention to use NFC mobile payment.

H2: Perceived usefulness positively relates to intention to use NFC mobile payment.

H3: Perceived ease of use positively relates to perceived usefulness of NFC mobile payment.

3.2 Compatibility

Compatibility, originated from the Innovation Diffusion Theory, refers to the degree to which an innovation is perceived as consistent with existing values, past experiences, and the needs of potential users (Rogers, 1995). Compatibility has been validated as an important factors determining individuals’ use of mobile service (Teo & Pok 2003; Wu & Wang 2005). As Yang et al. (2012) found in their
research on mobile payment that compatibility is the most important factor determining consumers’ intention to use mobile payment service. If NFC mobile payment can be well integrated into consumers’ daily lives, the compatibility of NFC mobile payment might influence their intention to use NFC mobile payment.

In the literature, compatibility has also been considered to have an indirect effect on intention to use NFC mobile payment via perceived ease of use and perceived usefulness (Kim et al. 2010). In this study, we suggest that compatibility also affect intention via perceived ease of use and perceived usefulness.

Thus, the following three hypotheses are proposed:

H4: Compatibility positively relates to intention to use NFC mobile payment.
H5: Compatibility positively relates to perceived ease of use of NFC mobile payment.
H6: Compatibility positively relates to perceived usefulness of NFC mobile payment.

3.3 Mobile payment knowledge

According to Rogers’s (1995) summary of various adoption studies, consumers should obtain enough information or knowledge from different channels to grow aware of an innovation and to see its advantages before they are ready to decide on adopting an innovation, i.e. something novel to them. Prior research also investigated the importance of consumers’ knowledge in determining IS adoption, such as Internet banking research (Al-Somali et al. 2009; Hanafizadeh and Khedmatgozar 2012) and mobile payment (Kim et al. 2010). Kim et al. (2010) explored the impact of mobile payment knowledge on perceived ease of use of mobile payment and found that mobile payment knowledge has significant impact on perceived ease of use for the initial adopters of mobile payment. As in the literature there is limited amount of research on mobile payment knowledge on consumers’ perceptions on the ease of use and usefulness of NFC mobile payment, this study attempts to explore the effect of mobile payment knowledge on perceived ease of use and perceived usefulness of NFC mobile payment. Consumers with a high level of mobile payment knowledge are likely to find the NFC mobile payment system to be easier to use and to be more useful. Thus, the following hypotheses are suggested:

H7: Knowledge positively relates to intention to use NFC mobile payment.
H8: Knowledge positively relates to perceived ease of use of NFC mobile payment.
H9: Knowledge positively relates to perceived usefulness of NFC mobile payment.

3.4 Perceived risk

Perceived risk has been argued to be a negative factor associated with IS adoption behaviour (Yang et al. 2012) and a major factor for consumers’ resistance to use mobile finance services (Luarn & Lin 2005; Mallat 2007; Shin 2009). Yang et al. (2012) have validated empirically the negative association between perceived risk and behavioural intention to use mobile payment among the users of an electronic payment company. Liu et al. (2012) also found that perceived risk to be a barrier for consumers to use mobile payment. Based on the above ground, we can argue that perceived risk is expected to exert negative effect on consumers’ intention to use NFC mobile payment. When consumers perceive there will be higher risk in using NFC mobile payment, they are likely to have lower intention to use NFC mobile payment. Thus, the following hypothesis is posited:

H10: Financial risk relates negatively to intention to use NFC mobile payment.
3.5 Perceived complementarity

Perceived complementarity refers to the indirect network externalities (Lin & Bhattacherjee 2008). Network externalities have been suggested to be an important factor leveraging IS users’ positive perceptions on adopting an IS. Network externalities are measured with referent network size and perceived complementarity (Lin & Bhattacherjee 2008). Referent network size reflects direct network externalities measured as the number of people in a user’s social network adopting a technology, i.e., because the growing number of adopters of an IS in users’ social network can help users’ perceptions on the usefulness of an IS. In the case of NFC mobile payment adoption the figures are too low to make any difference. As a consequence, we don’t include referent network size in the current study to explore NFC mobile payment adoption.

Perceived complementarity means that with the network growth, many complementary products, services and functions will be available to users (Strader et al. 2007). In the literature, perceived complementarity have been found to affect IS users’ perceptions on the utility of the IS. Such as Zhou (2011) empirically validated the relationship between perceived complementarity and perceived usefulness in the research context of instant message. Based on the above ground, perceived complementarity is expected to exert influence on perceived usefulness and perceived ease of use of NFC mobile payment adoption as perceived ease of use is a parallel belief related NFC mobile payment utility. Thus, the following hypotheses are proposed:

H11: Perceived complementarity positively relates to perceived ease of use of NFC mobile payment.

H12: Perceived complementarity positively relates to perceived usefulness of NFC mobile payment.

![Figure 1 Research model](image)

4 RESEARCH DESIGN

4.1 Research instrument development

In this study we employ survey research method to collect quantitative data with the research model above, consisting of seven constructs, including perceived ease of use, perceived usefulness, compatibility, perceived risk, perceived complementarity, mobile payment knowledge, and behavioural intention. The seven constructs are measured using multiple items. The selection and adaptation of items for constructs were discussed earlier especially in terms of their relevance for the revising of the research model to fit the phenomenon of NFC payments under study.
The measurements for perceived ease of use, perceived usefulness, and behavioural intention are measured using the items adapted from the original works of David (1989). Items measuring perceived complementarity are based on Lin and Bhattacherjee (2008). The three items measuring compatibility construct were modified from the works of Yang et al. (2012). The items measuring construct mobile payment knowledge are originally from Hanafizadeh and Khedmatgozar study (2012). The items for perceived risk are from Liu et al. (2012). For our study, we consider five-point Likert scale from strongly disagree (1) to strongly agree (5) to measure each item of the instrument at sufficient precision.

4.2 Data collection

We collected empirical data by a survey conducted in China in 2012. The data was collected at public places, i.e. railway stations, shopping malls, and business areas in 16 different cities across China, with the help of 20 volunteering college student residents. Individuals were invited to participate in our study randomly selected among the passers-by on the spot and on their consent. The respondents were asked to indicate what motivate them to use NFC-based mobile payment. Before answering the questionnaire the volunteers made a short introduction of NFC-based mobile payment to the respondents in case they did not possess any knowledge on NFC technology and made sure that the respondents had never used NFC mobile payment before. This way we received totally 377 responses. All of the 377 are usable, providing valid data base for this study.

The respondents consist of 190 males and 187 females, and more detailed demographic information of the respondents is presented in Table 1.

<table>
<thead>
<tr>
<th>Demographic profile</th>
<th>Items</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>190</td>
<td></td>
<td>50.4</td>
</tr>
<tr>
<td>Female</td>
<td>187</td>
<td></td>
<td>49.6</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>164</td>
<td></td>
<td>43.5</td>
</tr>
<tr>
<td>25-30</td>
<td>69</td>
<td></td>
<td>18.3</td>
</tr>
<tr>
<td>31-35</td>
<td>35</td>
<td></td>
<td>9.3</td>
</tr>
<tr>
<td>36-40</td>
<td>37</td>
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<td>9.8</td>
</tr>
<tr>
<td>41-50</td>
<td>60</td>
<td></td>
<td>15.9</td>
</tr>
<tr>
<td>Over 50</td>
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<td></td>
<td>3.2</td>
</tr>
<tr>
<td>Monthly cost of phone usage (RMB)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Less than 50</td>
<td>92</td>
<td></td>
<td>24.4</td>
</tr>
<tr>
<td>50-99</td>
<td>153</td>
<td></td>
<td>40.6</td>
</tr>
<tr>
<td>100-199</td>
<td>103</td>
<td></td>
<td>27.3</td>
</tr>
<tr>
<td>200-399</td>
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<td>5.6</td>
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<td>Over 400</td>
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<td>2.1</td>
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<td>Monthly income (RMB)</td>
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<td>Less than 2000</td>
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<td>44</td>
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<tr>
<td>2000-3000</td>
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<td>19.9</td>
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<tr>
<td>3001-5000</td>
<td>49</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>5001-8000</td>
<td>31</td>
<td></td>
<td>8.2</td>
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<tr>
<td>8001-15000</td>
<td>26</td>
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<td>6.9</td>
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<tr>
<td>Over 15000</td>
<td>30</td>
<td></td>
<td>8</td>
</tr>
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</table>

Table 1. Demographic information

4.3 Data analysis

In this research we employed structural equation modelling (SEM) to evaluate the proposed research model and hypotheses with the Partial Least Squares (PLS) software (Chin 1998). An algorithm procedure in PLS was employed to test the measurement model.

Convergent validity refers to the degrees to which the items of a scale that are assumed to be theoretically associated are also related in reality. Three criteria can be used to evaluate convergent
validity: i) factor loadings of the measurements on each construct should be over the value of 0.7; ii) the composite reliability (CR) of each construct should exceed the value of 0.8; and iii) the average variance extracted (AVE) by each construct should meet the cut-off value of 0.5 (Hulland 1999; Tenenhaus et al. 2005).

As shown in Table 2, all the factor loadings in the measurement model are above the threshold of 0.7. The values of composite reliability (CR) and average variance extracted (AVE) of all the constructs satisfy the recommended level of 0.8 and 0.5 respectively, indicating good internal consistency. We also measured Cronbach’s alpha values of latent variables and all the values are found to be over the threshold of 0.7. As shown in Table 3, the square roots of AVE of all constructs are greater than the correlations estimate with the other constructs. This reveals that each construct is more closely related to its own measures than to those of other constructs, and discriminant validity is therefore supported.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>Factor loading</th>
<th>Composite reliability</th>
<th>α</th>
<th>AVE</th>
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<tr>
<td>Perceived ease of use</td>
<td>PEOU1</td>
<td>0.888</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PEOU)</td>
<td>PEOU2</td>
<td>0.901</td>
<td></td>
<td>0.923</td>
<td>0.887</td>
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<tr>
<td></td>
<td>PEOU3</td>
<td>0.918</td>
<td></td>
<td></td>
<td>0.815</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>PU1</td>
<td>0.910</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(PU)</td>
<td>PU2</td>
<td>0.927</td>
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<td>0.938</td>
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<td></td>
<td>PU3</td>
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<td>0.835</td>
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<td>COM1</td>
<td>0.922</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(COM)</td>
<td>COM2</td>
<td>0.920</td>
<td></td>
<td>0.911</td>
<td>0.853</td>
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<tr>
<td></td>
<td>COM3</td>
<td>0.792</td>
<td></td>
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<td>0.775</td>
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<tr>
<td>Knowledge</td>
<td>KNO1</td>
<td>0.885</td>
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<td>KNO3</td>
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<tr>
<td>Perceived risk</td>
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<tr>
<td>(PR)</td>
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<td>0.863</td>
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<td></td>
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<td></td>
<td>0.857</td>
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<tr>
<td>Perceived complementarity</td>
<td>PC1</td>
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<tr>
<td>(PC)</td>
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<td>0.969</td>
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<td></td>
<td>PC3</td>
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<td></td>
<td>0.914</td>
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<tr>
<td>Intention</td>
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<tr>
<td>(INT)</td>
<td>INT2</td>
<td>0.962</td>
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<td>0.875</td>
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Table 2. Reliability and convergent validity statistics

<table>
<thead>
<tr>
<th>Construct</th>
<th>PEOU</th>
<th>PU</th>
<th>COM</th>
<th>KNO</th>
<th>PR</th>
<th>PC</th>
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<tr>
<td>PEOU</td>
<td><strong>0.902</strong></td>
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<td>0.548</td>
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<td>0.056</td>
<td>0.423</td>
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<tr>
<td>PU</td>
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<td>0.592</td>
<td>0.418</td>
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<td>COM</td>
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<td></td>
<td><strong>0.880</strong></td>
<td>0.471</td>
<td>0.010</td>
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<tr>
<td>KNO</td>
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<td></td>
<td></td>
<td><strong>0.844</strong></td>
<td>0.002</td>
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<td>PR</td>
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<td></td>
<td><strong>0.925</strong></td>
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<tr>
<td>PC</td>
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<td></td>
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<td></td>
<td><strong>0.956</strong></td>
<td>0.414</td>
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<tr>
<td>INT</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>0.915</strong></td>
</tr>
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</table>

Table 3. Discriminant validity

### 4.4 Research model and hypotheses test results

In this study we conducted a bootstrapping procedure in PLS to test the effect and the statistical significance of the parameters in the proposed research model. Figure 3 presents a graphical description of the research results, including both path coefficients and variances explained. The test results indicate that some of the proposed hypotheses are significant, whereas some are not. Compatibility ($\beta = 0.225; p < 0.001$), perceived ease of use ($\beta = 0.201; p < 0.001$), and mobile payment knowledge ($\beta = 0.198; p < 0.001$) are found to determine individuals’ intention to use NFC.
mobile payment, and perceived usefulness and perceived risk are not significant determinants of intention. Perceived complementarity and mobile payment knowledge are also found to influence intention to use NFC mobile payment indirect via perceived ease of use and compatibility. Perceived complementarity is found to have no significant influence on perceived usefulness and perceived risk, and mobile payment knowledge is found to have no significant impact on perceived risk.

The model interprets 34 per cent of perceived ease of use, 49.1 per cent of perceived usefulness, and 29.7 per cent of behavioural intention (See Figure 2).

Note: *(p < 0.05); ***(p < 0.001); and dashed line (postulated, but empirically insignificant relationships)

Figure 2. Results of model evaluation

5 DISCUSSION OF THE FINDINGS

In this study, we explore the factors motivating consumers’ adoption of NFC mobile payment. In order to adapt the TAM to the research context of mobile payment, we extended it by incorporating one user centric factor (mobile payment knowledge), two system characteristics (compatibility and perceived complementarity) and perceived risk in our research model.

The results show that three factors affect consumers’ intention to adopt NFC mobile payment directly and positively: 1) compatibility, 2) perceived ease of use, and 3) knowledge on mobile payment technology. Among the three variables, compatibility has the highest predictive values on intention to use NFC. It is followed by perceived ease of use and mobile payment knowledge.

Hence, our findings highlight the importance of compatibility. Compatibility has significant and positive direct influence on intention to adopt and indirectly via perceived ease of use. What is interesting, that it has also a strong, significant and positive relationship with the perceived usefulness, even though perceived usefulness does not implicate intention to adopt NFC. We think that consumers care most about whether NFC mobile payment is versatile and easy enough to meet the ways of paying at present.

Consistent with our expectations and prior research, we found that perceived ease of use still plays important role in determining consumers’ intention to use NFC mobile payment - consumers are more likely to adopt an IS if it is easier to use, and here it is an indication of its usefulness, too. The strong, significant and positive effect of perceived ease of use on perceived usefulness is consistent with prior research findings (Kim et al. 2010), but does not indicate any higher intention to adopt. Hence, we can state that the indirect effects of perceived complementarity and compatibility influence intention to
adopt via perceived ease of use. This means that the system characteristics of NFC, such as ancillary functions and compatibility with other services can help enhance the initial adopters’ perception of easiness and consequently, the willingness to adopt.

Knowing more about NFC means of payment increases use intention, too. As of doing the research, consumers did not know much about mobile payment, which is only in its initial stage in China.

Contrary to our expectations, perceived usefulness and perceived risk are not significant predictors of consumers’ intention to use NFC mobile payment. This is also in contrast to prior findings in predicting mobile payment success (Yang et al. 2012; Kim et al. 2010). Plausible reasons for the findings might be that the users’ expectations are that payments are not exactly useful as such, but must be done nevertheless, and in safe and secure way. Anyway, there is no clear indication of risks, or perceived usefulness to affect the intention to adopt NFC among the non-users.

The impact of compatibility and mobile payment knowledge on perceived usefulness reflects that the compatibility of NFC mobile payment system and consumers’ mobile payment knowledge will improve their understanding on the usefulness of NFC mobile payment.

To summarize our findings, it seems the factors influencing the intention to adopt new means of payment, NFC, are fewer than expected. It is better to be compatible with existing values, past experiences, and the needs of potential users, it must be easy to use, and the more you know about NFC, the more willing they are to adopt. It seems that usefulness is not expected as such from payment systems, and risks are not seen as an issue, while considering to adopt NFC mobile payment. We think that the proximity of paying with NFC might moderate risk perception in this context.

6 IMPLICATIONS FOR RESEARCH AND PRACTICE

First, our study extended existing adoption intention models in the context of means of proximity payments (NFC), by identifying factors affecting the adoption in earlier studies. We added those factors, i.e., user characteristics, systems characteristics, and negative barriers (perceived risk), found significant in adopting mobile payment systems to a research model, which was then applied empirically in China in 2012, gathering 377 usable responses.

When analysing the data with our model, we found out that compatibility and ease of use are critical from the point of view of adoption, and that informing about NFC would increase the intention to adopt it as well. However, our finding on the insignificant influence of perceived usefulness on intention to use NFC mobile technology implies that one cannot use TAM as such, when studying non-users’ intention to adopt. So, for further research on the matter, researchers should develop better-suited models to the situation.

For mobile payment service providers, the results are important. First, the payment system must be easy to use and compatible with users’ expectations on payment systems of today in order to get the system adopted – complications and extra tricks should be hidden from the payment transaction. Second, users know little about the technology, but if they knew more it would boost adoption. It could be further boosted with complementary features, but only if they are easy to use.

Risk perception was not associated with the intention to use NFC in our study. We can argue that there might have been no frauds in using NFC (either the technology really is safe, or it has not been in wide use), or that users can tolerate risks in paying. We think more viable explanation than the latter is that the NFC has to be safe and secure, because this is the default for any payment system, otherwise the authorities shall intervene. It is further reinforced by the proximity of payment transaction at POS with NFC (you can withdraw from business transaction), there are no reported misbehaviours, or deficiencies in the system discussed in public.

The findings also can cast light the slow diffusion of NFC as the means of payment from the customers’ perspective. Because NFC implementations are expected to be easy to use and compatible with existing or new POSs, its slow adoption may be due to the lack of information on its ease of use.
(with additional features) and compatibility with existing means of payments. Or, we are not producing yet such NFC-based payment systems.

7 LIMITATIONS AND FUTURE RESEARCH

The current study also has its limitations. First, as our findings suggest a simple model in explaining the intention to adopt NFC–based payment systems, the most obvious future research is to simplify the model further, and to re-test it with the same data set. Secondly, the research model was tested with a limited empirical data collected in China, so one could expand the data collection. A useful experiment would compare NFC users’ and non-users’ intentions to see, if the same model still fits, and if the risk perception is different. Finally, there might be some other variables related to user characteristics, especially their risk propensity.

REFERENCE


