Realising M-Payments: modelling consumers’ willingness to M-pay using Smart Phones

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It is predicted that significant and ongoing investment in M-Commerce platforms and application development by commercial entities will fundamentally change consumers’ shopping and web browsing behaviours. However, the evolving behaviour of Smart Phone users is somewhat tempered by concerns over M-Payments. If Smart Phones are to reach their full M-Commerce potential, the ability of consumers to transact and pay for products/services through these devices in an easy, safe and reliable manner must be addressed. In response, this paper contributes a theoretical model and empirically tests the model to explore Irish consumers’ perceptions of using Smart Phones to make M-Payments for products/services. The findings present conclusive evidence that trust is the most powerful factor influencing consumers’ willingness to use Smart Phones to make M-Payments. While perceived usefulness and perceived ease of use influence the payment decision, their impact is much lower. Mobile self-efficacy and personal innovativeness have almost no direct impact. The paper concludes that irrespective of individuals’ high levels of personal innovativeness or mobile self-efficacy and irrespective of whether Smart Mobile Media Services are perceived as useful and easy to use, consumers will not make M-Payments, until they are convinced that Smart Phone M-Payment systems are safe and reliable.

Keywords: Smart Phones; user behaviour; M-Payments; trust; PLS

Introduction

The notion that Smart Phones could become valuable and critical business tools for the delivery of M-Commerce products and services has long been touted by academics, professionals and the media (Varshney and Vetter 2002, Bauer et al. 2005, Leppänieni and Karjaluoto 2005, Gao and Küpper 2006, Hsu and Kulviwat 2006). Smart Phones enable the delivery of a wide range of transactional M-Commerce products and services, including highly individualised and location-based Smart Mobile Media Services (SMMS) (O’Reilly and Duane 2010). Smart Mobile Media Services:

‘...provide mobile network subscribers with permission and subscription based, dynamically profiled, location, context and task specific, mobile Internet applications, content, products, services and transactions for Smart Phones’.

(O’Reilly and Duane 2010, p. 197)

In particular, location-based SMMS have resulted in substantial changes to consumers’ interactions with retailers via the mobile web, especially when coupled with mobile couponing (Jayasingh and Eze 2009, Goldman 2010). Thus, SMMS are integral to the M-Commerce value chain proposition. Numerous industry experts predict that the range and extent of SMMS available through Smart Phones and other Smart Mobile Media Devices will increase significantly over the coming years, as increasing numbers of commercial entities invest in M-Commerce platforms and applications, to satisfy growing consumer demands for fully fledged multichannel retailing (Skeldon 2011). Significant investment has taken place in recent times on M-Commerce platforms and application development by major global organisations such as, KFC (Higgs 2008), Starbucks (Xu et al. 2010), Microsoft, McDonalds, Coca-Cola and P&G (Wei et al. 2010). Indeed it is significant that WorldNet TPS predicts that M-Commerce will achieve in the next 3 to 4 years, what E-Commerce has achieved in the last 15 years (Enterprise Ireland 2011).

When considering the future of M-Commerce and realisation of the potential of Smart Phones, the establishment of standardised, interconnected and widely accepted mobile payment (M-Payment) procedures is crucial (Zhong 2009). It is predicted that M-Payments, using mobile devices for digital and physical goods, could exceed $630 billion in 2014 alone (Juniper Research 2010). According to Egger (2001), trust in...
any payment system is influenced by anonymity, security, reliability, the amount of control that users have and the reputation of the entity that introduces the system. One must also recognise that the ‘M-Payments Process’ requires specialised M-Payment hardware and software, a vendor accepting the M-Payment, an M-Payment processing service, legislation and consumer rights governing the M-Payment process and an independent consumer rights advocate regulating the process (Ondrus et al. 2009, Ondrus and Lyytinen 2011). This multidimensionality of trust in M-Payments is reflected in the definition of M-Payments adopted for this study. The authors adopt the definition provided by Dinez et al. (2011) who define M-Payments as:

´payments made or enabled through digital mobility technologies, via handheld devices, with or without the use of mobile telecommunications networks. These payments are digital financial transactions, although not necessarily linked to financial institutions or banks´ (p. 5).

In some countries including Japan, Singapore and Korea, M-Payment services have become established and widely used (Schaettgen and Taka 2010). However, in a global context, and particularly in Europe, M-Payments are still in their infancy. In fact, Schierz et al. (2010) report that less than 1% of mobile phone users have made an M-Payment. Interestingly, several researchers (Baruteu 2008, Matthews et al. 2009, Xu et al. 2010, Andreev et al. 2011, Rao 2011) reveal that while consumers have positive attitudes towards mobile advertising, mobile coupons, mobile social media and mobile media, they do not possess positive attitudes towards mobile shopping, and in particular making M-Payments using Smart Phones. Herein lies the problem: although growth forecasts for M-Payment services have been very positive, the reality on the ground is quite different (Schierz et al. 2010). These studies indicate that, while consumers are willing to use Smart Phones to engage in M-Commerce transactional tasks, they are reluctant to make an M-Payment. This is very significant, as the realisation of the enormous commercial potential of Smart Phones for M-Commerce is entirely contingent on consumers’ willingness to make an M-Payment (WMPay) using Smart Phones and, as such, complete the M-Commerce transactional loop. Thus, the primary question emerging from the extant literature is that what factors influence consumers’ willingness to use a Smart Phone to make M-Payments?

**Review of the literature: state of the art**

Few comprehensive attempts have been made already by researchers to answer this question with extant studies focussing on the broader field of M-Commerce. Kim and Zhang (2009) suggest that, although there can be numerous factors influencing people’s adoption of Smart Phone services, such factors are underinvestigated in the extant literature. While some M-Commerce-based adoption studies have been conducted, they have been primarily focussed on mobile marketing/advertising and mobile banking adoption. Bauer et al. (2005) reveal the importance of personal innovativeness (PI) in the adoption of mobile marketing. Similarly, Gupta et al. (2011) note that PI has a positive impact on willingness to use mobile location-based services (LBS). Lee et al. (2011) suggest that mobile self-efficacy (MSE) influences consumers’ adoption of mobile advertising. Chen et al. (2011) tested TAM in a study on Smart Phone acceptance and reports that MSE also plays a positive role on perceived ease of use (PEU).

A number of researchers (Siau et al. 2004, Xu and Gutierrez 2006, Mallat 2007) suggest that trust positively influences consumers’ decisions to engage in M-Commerce transactional tasks. Lin and Wang (2006) reveal that trust also has a positive impact on consumer loyalty and satisfaction towards M-Commerce. Chung and Kwon (2009) and Lie et al. (2010) suggest that consumers’ perceptions of competence, integrity and ethical commitment in mobile banking and M-Commerce were also important trust factors influencing adoption decisions. Previously, trust has been identified as a significant determinant in influencing consumers’ E-Commerce transactions in several studies (e.g. Jarvenpaa et al. 2000, Gefen et al. 2003, Verhagen et al. 2006, Chen and Barnes 2007). Some E-Commerce studies reveal that trust factors such as perceived security control, perceived privacy control (Cheung and Lee 2003, Roca et al. 2008), perceived integrity and perceived competence (Cheung and Lee 2003) greatly influence a consumers trust in online vendors, and thus their adoption decisions. Governance and independent regulation of the online E-Commerce environment are also trust factors that influence adoption according to Cheung and Lee (2003).

Viehland and Yoong Leong (2010) and Dahlberg et al. (2007) report that perceived usefulness (PU) and PEU positively impact upon consumer willingness to make M-Payments at instore electronic points-of-sale. Kim et al. (2010) suggest that consumers’ are willing to make an M-Payment if they find the system to be useful for their transaction needs. Schierz et al. (2010) note that ease of use is even more important for M-Payment services, as they compete with established payment services.

Interestingly, few of the previous M-Commerce studies have been conducted in a European context.
However, this is largely because European countries have been a laggard when compared to Asian countries with respect to the adoption of M-Commerce. In fact, M-Payment services have largely failed to entice or convince European consumers, and several M-Payment companies/initiatives in the EU have already been abandoned (Dahlberg and Oorni 2007, Mallat 2007). Thus, while several M-Commerce adoption studies exist in the literature, few of these specifically focus on M-Payments, few are European based and none of these studies are sufficiently comprehensive with respect to the inclusion of previously established, empirically tested, constructs from both E-Commerce and M-Commerce literature. Gaining a better understanding of European consumers’ perceptions of using Smart Phones to make M-Payments is thus required, in order to develop M-Payment services for successful adoption by consumers (Dahlberg and Oorni 2007). Dahlberg et al. (2008) state that:

‘[...] we believe that more theory based empirical research is needed to enhance the current understanding of the M-Payment services markets. [...] to improve the quality and relevance of M-Payment research, we also recommend that researchers collect more empirical data backed by guiding theories’. (Dahlberg et al. 2008 p. 178)

This paper makes a number of contributions to both theory and practice. Firstly, it contributes a conceptual model for exploring consumer’s perceptions of M-Payments. It explores variables that had not previously been investigated pertaining to their impact on consumer’s WMPay. It adopts and combines several factors identified and empirically tested in previous E-Commerce and M-Commerce studies, namely trust, PI, PEU, PU and MSE, in order to investigate their impact on Irish consumers’ willingness to use Smart Phones to make M-Payments. An understanding of these factors can have significant implications for M-Payment service providers in developing more appropriate M-Payment services and applications, guiding M-Payment deployment strategies and information and marketing campaigns. Furthermore, it informs mobile vendors of how to create more positive relationships with consumers in the M-Commerce environment.

From the perspective of theory development, adding to the existing knowledge in the field of M-Commerce about the factors influencing adoption of M-Payment systems, especially in a European context represents a significant contribution through enabling researchers develop richer theoretical models that better explain adoption behaviours. Furthermore, this study serves as an important starting point from which researchers can engage in future comparative cross-cultural studies of M-Payment adoption in European and non-European markets.

The remainder of this paper is structured as follows. The next section discusses conceptualisation of the theoretical model and identifies four research hypotheses. Following this, methodological design and data analysis is presented. The subsequent section presents the results of the study and the research model evaluation. The theoretical implications of the findings and the challenges for practitioners are then discussed, with concluding remarks and study limitations ending the paper.

Theoretical model conceptualisation and research hypothesis

M-Payments are a critical enabler of the true commercial value of the Smart Phone (O’Reilly and Duane 2010, Andreev et al. 2011). Although literature proposes three fundamental models for handling M-Payments: (1) mobile network operator (MNO) led, (2) bank and financial institution led and (3) third party led, with numerous variations/ combinations of these being possible (Turner 2009); in practice, an accepted M-Payment model to facilitate the widespread adoption of M-Payments still remains elusive. Ultimately, consumers will play a key role in determining the ‘winning’ model, as consumer buy-in for any proposed M-Payment model is critical. Thus, the enormous potential of Smart Phones for M-Commerce is entirely contingent on consumers’ willingness to make M-Payments using Smart Phones.

However, consumer acceptance, or WMPay, is the greatest barrier to M-Payment adoption, which is very much influenced by their assessment of the risk involved (Mallat 2007). Thus, it is of great concern that there is considerable evidence that users perceive significant risks and uncertainty in interacting with vendors through mobile devices (Im et al. 2008). Viehland and Yoong Leong (2010) contend that in order for M-Payments to succeed, consumers must perceive them as being useful and easy to use, but most importantly, secure and safe to use.

Viehland and Yoong Leong (2010) and Dahlberg et al. (2007) report that both PU and PEU, positively impact consumer WMPay at retail points-of-sale. Therefore, PEU, PU and perceived payment reliability, which incorporate a consumer’s perception of the security and perceived safety of making an M-Payment using a Smart Phone, are three important issues for consumers if they are to adopt M-Payment services. Chen et al. (2011) tested TAM in their recent study on Smart Phone acceptance and reveal that MSE also plays a positive role on PEU.
Personal innovativeness, or an individual’s willingness to try out new technology, also appears to have a significant impact on the adoption of new technologies (Agarwal and Prasad 1998). While Agarwal and Prasad (1998) examined the moderating effects of PI on intention to adopt, Gupta et al. (2011) reveal that PI has a direct positive impact on willingness to use mobile LBS. Thus, PI may also impact upon an individual’s WMPay.

Several studies (e.g. Jarvenpaa et al. 2000, Gefen et al. 2003, Verhagen et al. 2006, Chen and Barnes 2007) reveal that trust is a significant determinant in influencing consumers’ E-Commerce transactions, as a lack of trust discourages consumers from making a transaction. More recently, a number of studies (Siau et al. 2004, Xu and Gutierrez 2006, Mallat 2007) indicate that trust is also a significant determinant of consumers’ decisions to engage in M-Commerce transactional tasks. Lin and Wang (2006) also found that trust has a positive impact on consumer loyalty and satisfaction towards M-Commerce. Thus, trust is an important component of any model seeking to explain a consumers’ WMPay.

Thus, having reflected on prior research, this study examines the impact of trust (trust), PI, PEU, PU, and MSE, in order to develop a model explaining consumers’ willingness to use Smart Phones to make M-Payments. The following discussion describes the development of the constructs used in this study.

Trust

A user’s feelings of trust towards an online service is an important determinant in considering its usage (Chau et al. 2007, Roca et al. 2008). Sanchez-Franco and Rondan-Cataluna (2011) believe trust is the most important antecedent. Lie et al. (2010) found that trust is crucial in M-Commerce, given the anonymous buyer–seller interactions and lack of formal contractual agreements, while Varnali and Toker (2009) consider a lack of trust as a major obstacle in the adoption of mobile services. Similarly, Mallat (2007) found that trust in vendors and MNOs is essential to reduce consumers perceived risks of M-Payments.

We therefore present our first hypothesis:

Hypothesis 1: Consumers’ trust positively impacts upon their willingness to make M-Payments using Smart Phones.

However, trust is a multidimensional construct, studied in a variety of social science disciplines (Bhattacherjee 2002) and with a multitude of definitions (Hsu et al. 2007). Thus, Roca et al. (2008) suggest that, by considering trust as a reflection in different dimensions, a better understanding of trust as a construct can be achieved. Thus, a thorough review of the literature reveals seven manifest variables of trust (Table 1).

Shortcomings in security controls reduce consumer’s trust in M-Payment systems and hinder the emergence of these systems (Chou et al. 2004, Dewan and Chen 2005). When online vendors have implemented the appropriate security mechanisms, consumers perceive online purchasing as being safe (Roca et al. 2008). Perceived privacy control is also a critical factor in consumers’ acceptance of online services, as consumers are reluctant to share any personal or financial information with online vendors because they feel that these vendors could use this information for unintended purposes. In order to protect customers’ privacy, organisations must protect all the personal information, which they collect either directly or indirectly from other organisations (Wu and Tsang 2008).

If individuals perceive a vendor to be honest or of high integrity, their intention to use the electronic channel will be higher (Roca et al. 2008). Roca et al. (2008) suggest individuals will have greater trust in an electronic channel if they are less concerned about unauthorised use of, or illegal access to, their data by third parties. Privacy policies (Flavián and Guinalíu 2006) and Social Media feedback mechanisms (Lorenzo-Romero et al. 2011) convey signals of online vendor integrity. Privacy policies (Chen et al. 2011) and guarantee policies (Chiu et al. 2009), which are associated with the ethical perception of web vendors in terms of their ability to handle sensitive consumer information and consumers’ rights and interests, play a significant role in influencing consumer trust.

Yang et al. (2009) reveal higher levels of perceived ethical commitment also increases trust and heavily influences online purchasing decisions. Flavián and Guinalíu (2006) and Sanchez-Franco and Rondan-Cataluña (2011) suggest perceived competence is also particularly important for an online vendor as they have to persuade the consumer that, in addition to being honest and reliable, they also have the technical, financial and human resources required to complete the transaction successfully.

Consumer trust in vendor compliance with legislation and the existence of an independent regulatory authority to protect and regulate transactions and data are essential to reduce consumers perceived risks of making an M-Payment (Cleff 2007). Regulatory safeguards promote consumer confidence in engaging in online transactions, and online vendors should prioritise their support for regulation (Sanchez-Franco and Rondan-Cataluña 2011). It is important that an independent objective regulator and the government
should play central roles in establishing legislation and standards of service (Cheung and Lee 2003). Online vendors can minimise uncertainty by clearly displaying their rules and all the necessary legal aspects and seals of approval (e.g. VeriSign and TRUSTe) (Sanchez-Franco and Rondan-Cataluña 2011).

**Personal innovativeness**

Agarwal and Prasad (1998) validated a construct for the domain of information technology called ‘personal innovativeness in the domain of IT’ (PIIT) for characterising technology adoption, which is defined as ‘the willingness of an individual to try out any new information technology’. Personal innovativeness is specific to an individual (Agarwal and Prasad 1998), and it is the same as innate innovativeness, which is part of an individual’s personality (Im et al. 2003). Innate innovativeness had a positive impact on driving consumer acceptance of mobile marketing (Bauer et al. 2005), and these first adopters often become a source of opinion on innovations for their peers (Barmecha 2011). Similarly, Gupta et al. (2011) suggest that PI had a significant impact on intention to use mobile LBS. In addition, Lu et al. (2005) report that PIIT is an important stimulus influencing perceptions of wireless Internet services via mobile technology, and that PIIT significantly influences both PU and PEU, with the latter being particularly affected. Thus, in the context of this study, we propose that:

Hypothesis 2a: Personal innovativeness positively impacts upon consumers’ perceptions of the ease of use of a Smart Phone to make an M-Payment.

Hypothesis 2b: Personal innovativeness positively impacts upon consumers’ willingness to make M-Payments using Smart Phones.

Hypothesis 2c: Personal innovativeness positively impacts upon consumers’ perceptions of the usefulness of a Smart Phone to make an M-Payment.

**Perceived ease of use and perceived usefulness**

Ease of use has been documented in the extant literature as being an imminent acceptance driver of mobile applications (Schierz et al. 2010). A review of the literature revealed a small number of researchers employed TAM to explore M-Payments. Viehland and Yoong Leong (2010) and Dahlberg et al. (2007) examined PU and PEU on consumer willingness to use M-Payment services at retail points-of-sale and report that most consumers consider M-Payments easy to use and useful. Schierz et al. (2010) note that ease of use becomes even more important for M-Payment services, which compete with established payment solutions, and thus need to provide benefits when it comes to ease of use. Therefore, one of the main reasons for the slow diffusion of M-Payments in particular could be a failure in understanding the perception among consumers of the ease of use of making M-Payments using Smart Phones. Thus, having explored extant literature on PEU and PU, we propose that:

Hypothesis 3a: Perceived ease of use will have a positive effect on consumers’ willingness to use Smart Phones to make M-Payments.

Hypothesis 3b: Perceived usefulness will have a positive effect on consumers’ willingness to use Smart Phones to make M-Payments.

**Perceived mobile self-efficacy**

Self-efficacy refers to one’s belief in what they can do with the capability or skills they have (Hsu et al. 2011) or in their capability to perform a particular behaviour (Lai 2008). According to Bandura (1994), the nature and scope of perceived self-efficacy undergoes several changes as new and emerging competency demands arise, which require further development of self-efficacy to function successfully. Evidence of this exists in the literature as measures for perceived self-efficacy have emerged for computer self-efficacy, Internet self-efficacy and, in recent times, MSE. Computer self-efficacy measures one’s confidence in mastering a new technology or software with a certain degree of confidence (Lai 2008). Internet self-efficacy specifically relates to usage of E-Commerce, as it requires a skill set beyond simple computer use (Keith et al. 2011). Young Hoon et al. (2009) note that E-Commerce transaction self-efficacy, as a situation-specific self-efficacy, positively influences a consumer’s online purchase intention. Evidence of this may be emerging in recent M-Commerce literature, as Lee et al. (2011) report that MSE has a significant influence on attitude towards consumers’ willingness to adopt mobile advertising. Furthermore, Igbia and Iivari (1995) suggest that computer self-efficacy had a ‘strong direct effect on perceived ease of use’ (p. 587), underlining its importance in the decision to use technology. Evidence of this also exists in the M-Commerce literature as Chen et al. (2011) tested TAM in their recent study on Smart Phone acceptance and conclude that MSE played a positive role on PEU. However, irrespective of whichever form of technology-related self-efficacy arises in the literature, knowledge and confidence play an important role (Khorrami-Arani 2001) as do judgments of what one can do with the skill-set one possesses (Bandura 1994). Thus, in this context, we propose that:

Hypothesis 4a: Mobile self-efficacy positively impacts upon consumers’ PEU in using Smart Phones to make M-Payments.
Table 1. Trust measures for this study.

<table>
<thead>
<tr>
<th>Element</th>
<th>Literature</th>
</tr>
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<tbody>
<tr>
<td>Perceived Privacy Control</td>
<td>Roca et al. 2008, Wu and Tsang 2008</td>
</tr>
<tr>
<td>Perceived Competence</td>
<td>Flavián and Guinaliu 2006, Sanchez-Franco and Rondan-Cataluña 2011</td>
</tr>
<tr>
<td>Perceived Governance</td>
<td>Cheung and Lee 2003, Cleff 2007, Sanchez-Franco and Rondan-Cataluña 2011</td>
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</tbody>
</table>

Hypothesis 4b: Mobile self-efficacy positively impacts upon consumers’ willingness to use Smart Phones to make an M-Payment.

According to Bandura (1986), a self-efficacy instrument must assess the specific skills needed for performing an activity. Given that over 300,000 mobile applications (Apps.) have been developed in the last 3 years (MobiThinking 2011), and this study does not exclusively focus on MSE, it is simply not possible at this time to create a self-efficacy measure capable of precisely assessing the specific skills needed to use each Application (App). Therefore, the researchers utilised a grounded approach in this regard, adopting the approach recommended by Vispoel and Chen (1990) who advised researchers to develop new, or significantly revise existing, measures for each study of self-efficacy. Thus, a number of indicators of self-efficacy were developed for use in this study through adoption and extension of extant literature. These items are presented in the indicator descriptor table (Table 2).

Therefore, through a detailed review of the literature, four hypotheses emerged, enabling the generation of a research model, presented in Figure 1, to investigate consumers’ willingness to use Smart Phones to make M-Payments.

Willingness to make an M-Payment

Most measures of willingness to make an electronic payment, and in some cases an M-Payment (e.g. Viehland and Yoong Leong 2010), reflect on previous measures established in the marketing literature that simply measure ‘price sensitivity’. The purpose of willingness to make M-Payment in this study is not to study price sensitivity with respect to mobile purchases but rather consumers’ willingness to use the ‘M-Payment Process’ as previously referred to in the Introduction section. However, one must recognise that the M-Payment market is still in its infancy, and no single M-Payment model has emerged as the de facto and may not do so for a considerable period of time given the lucrative market that exists and that rival services will continue to compete with each other and invest significant amounts of money in acquisitions and research (Ondrus and Lyytinen 2011). Thus, different mobile vendors adopt different M-Payment models, and consequently consumers currently interact with multiple M-Payment models and will continue to do so for the foreseeable future.

Ondrus and Lyytinen (2011) suggest that ‘it is still premature to conclude any certain scenarios. The upcoming announcements of the new players will probably give more insights into the variability of future scenarios for mobile payments’. Measurement of WMPay in this study embraces this idea and reflects consumers’ WMPay using all four current M-Payment models in the marketplace: MNO driven (e.g. O2), third-party driven (e.g. PayPal), credit card company driven (e.g. Visa) and domestic bank driven (laser debit card – similar to Maestro) driven. Ondrus et al. (2009) posit ‘that there is a lack of multiperspective research that is needed to obtain a holistic view of payment system adoption and evolution. In addition, we need to conduct research that follows more than just one perspective at a time’. Thus, this research develops a new measure for WMPay to reflect the current state of research. This measure reflects the M-Payment models identified by Ondrus et al. (2009) of M-Maestro, PostFinance and Verified by Visa.

Method

Design

An online survey was developed to operationalise the research model. Following an initial iteration of the survey as per Hair et al. (2006), the authors pretested the survey with Smart Phone ‘experts’ (active Smart Phone owners and users) in order to assess the semantic content of construct items. The authors retained those items that best fitted and reflected the definitions of the constructs, a process that facilitated the refinement and streamlining of the items included in this survey. In order to minimise non-response bias, we utilised some of the principles purported by Vicente and Reiss (2010) pertaining to designing web-
<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Survey statement</th>
<th>Adapted from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived ease of use (PEU)</td>
<td>PEEASY</td>
<td>Overall, I find SMMS easy to use.</td>
<td>Luarn and Lin 2005, Chau et al. 2007</td>
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<tr>
<td></td>
<td>PEKNOW</td>
<td>Use of SMMS does not require a lot of knowledge.</td>
<td></td>
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<td></td>
<td>PETECH</td>
<td>Use of SMMS does not require a lot of technical skills.</td>
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<tr>
<td>Perceived usefulness (PU)</td>
<td>PUACCOMP</td>
<td>Use of SMMS can decrease the time required for my activities.</td>
<td>Agarwal and Prasad 1998, Venkatesh 2000</td>
</tr>
<tr>
<td></td>
<td>PUPROD</td>
<td>Use of SMMS can increase my output for the same amount of effort.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PUEFFWA</td>
<td>Use of SMMS improves the effectiveness of my work activities.</td>
<td></td>
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<td></td>
<td>PUEFFPA</td>
<td>Use of SMMS improves the effectiveness of my personal activities.</td>
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<tr>
<td>Personal innovativeness (PI)</td>
<td>PIEXPERI</td>
<td>I like to experiment with new SMMS.</td>
<td>Agarwal and Prasad 1998, Bauer et al. 2005, Gupta et al. 2011</td>
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<td></td>
<td>PIFIRST</td>
<td>Among my peers, I am usually the first to try out new SMMS.</td>
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<td></td>
<td>PIPEEROPIN</td>
<td>My peers highly rate my opinion of SMMS.</td>
<td>Barmecha 2011</td>
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<td></td>
<td>MSEMOVVMUS</td>
<td>I feel confident using SMMS to access online movies and music.</td>
<td></td>
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<td></td>
<td>MSETVMED</td>
<td>I feel confident using SMMS to access television news media.</td>
<td></td>
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<td></td>
<td>MSEPRINTMED</td>
<td>I feel confident using SMMS to access print news media.</td>
<td></td>
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<tr>
<td></td>
<td>MSETVPROG</td>
<td>I feel confident using SMMS to watch television programmes.</td>
<td></td>
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<td></td>
<td>MSEGAMES</td>
<td>I feel confident using my Smart Phone to access gaming services</td>
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<tr>
<td></td>
<td>MSESOCMED</td>
<td>I feel confident using my Smart Phone for social media.</td>
<td></td>
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<tr>
<td>Trust (Trust)</td>
<td>LFROBUST</td>
<td>Legal frameworks for SMMS provision are sufficiently robust to protect consumers.</td>
<td>Cheung and Lee 2003, Chau et al. 2007</td>
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<tr>
<td></td>
<td>PCEXPERT</td>
<td>I believe that SMMS providers have sufficient expertise and resources to provide these services.</td>
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<td></td>
<td>PECETHIC</td>
<td>I believe that SMMS providers will act ethically when capturing, retaining, processing and managing my personal data.</td>
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<td></td>
<td>PINTHONEST</td>
<td>I believe that SMMS providers act honestly in dealing with consumers.</td>
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<td></td>
<td>PPCCONFPRIV</td>
<td>I am confident in the privacy controls of SMMS providers.</td>
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<td></td>
<td>PSCPERSDATA</td>
<td>I believe that all SMMS providers implement adequate security measures to secure my personal data.</td>
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<tr>
<td></td>
<td>REGAUTH</td>
<td>Regulatory bodies for SMMS provision are sufficiently authoritative to regulate SMMS providers.</td>
<td></td>
</tr>
<tr>
<td>Willingness to make an M-Payment (WMPay)</td>
<td>PPRMNO</td>
<td>I consider it safe to make an M-Payment through my mobile network operator when using SMMS.</td>
<td>Self-created</td>
</tr>
<tr>
<td></td>
<td>PPRAFE3RD</td>
<td>I consider it safe to make an M-Payment through a 3rd party payment company when using SMMS.</td>
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<td></td>
<td>PPRAFECC</td>
<td>I consider it safe to make an M-Payment with my credit card when using SMMS.</td>
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<tr>
<td></td>
<td>PPRAFELASER</td>
<td>I consider it safe to make an M-Payment with my laser card when using SMMS.</td>
<td></td>
</tr>
</tbody>
</table>
distributed questionnaires. Through a review and analysis of the extant literature, they illustrated that, by applying such principles, the risk of non-response bias is greatly reduced. Therefore, we employed those principles in this study: screen design layout, avoided lengthy questions, included an intermittent progress indicator and applied a radio button format. In dealing with the danger of common method bias, we began by utilising the principles of Podsakoff et al. (2003). We obtained measures of the predictor and criterion variables from multiple sources (further, construct reliability tests were conducted [Assessment of measurement models section] within the measurement PLS models validation). Furthermore, we ensured the questionnaire was anonymous and avoided the use of complicated and ambiguous wording.

The next phase of this research posted the survey online using a web-based survey administration tool located at www.SurveyMonkey.com. The target population of users were informed of this survey by posting a survey notification and weblink on an Irish Smart Phone users’ discussion group located at www.Boards.ie. This online group had 928 members with average monthly user activity rates of 42%. Responses were collected throughout June 2010. Irish Smart Phone users were selected as the target population as there had been no research conducted on M-Payments in Ireland to our knowledge, despite Ireland having one of the largest rates of mobile phone usage in Europe per head of population, with a 117.3% penetration rate as of December 2010 (ComReg 2011). In fact, one out of every two mobile phones sold in Ireland in 2010 were Smart Phones (Vodafone-Ireland 2010).

In operationalising the constructs, indicators arising from the literature were either wholly adopted or revised in order to develop questions for data collection. In addition, the researchers created a number of new measures to measure consumers’ WMPay. Table 2 presents these indicators, their associated questions and their sources in the literature where applicable.

Data analysis

The study employed structural equation modelling, a model-testing tool, for data analysis and hypotheses testing. Choosing the PLS (SEM) approach, which uses component-based estimation, is appropriate since it allows simultaneous exploration of both the measurement and the structural models. In addition, the PLS approach compared to covariance-based SEM allows for testing of the relationships in the model with less restrictive requirements. Another reason for choosing PLS is that this tool is considered to be appropriate for testing theories at earlier stages of development (Fornell and Bookstein 1982) as in the context of this study. This technique facilitates the exploration of two models: the measurement (outer) model, relating the measurement variables to their latent variables (LVs); and the structural (inner) model, relating the LVs to each other (Chatelin et al. 2002, Tenenhaus et al. 2005, Diamantopoulos 2006).

Results

Data statistics

One month after posting the survey notification and weblink to the Irish Smart Phone users’ discussion group located at www.Boards.ie, the authors closed the survey collection mechanism located at www.SurveyMonkey.com. Analysis of the online survey hosted on Survey Monkey revealed that 141 of the 928 Irish Smart Phone Users’ online discussion group invited to participate in the study had responded. However, only 82 of the responses were deemed valid, as 59 respondents had failed to complete the entire survey, primarily citing the high number of questions in the survey as the reason for abandoning the survey before completion. Despite this, respondents originated from 12 of Ireland’s 26 countries including large cities such as Dublin, Cork and Waterford, which when combined accounted for 68% of respondents. As shown in Table 3, the demographic attributes of a respondent to this survey is a person:

![Smart Phone M-Payment model](image-url)
between the ages of 30 and 50 years; living in a large Irish city; educated to a postgraduate level and in full-time employment earning €40,000 to €80,000 per annum.

Sixty-two percent of respondents used the Internet for more than 2 h per day; 83% of respondents accessed the Internet using their Smart Phone for less than 1 h per day, while 40% sent more than 10 SMS per day. Seventy-eight percent of respondents never sent an MMS, and 56% never sent email from their Smart Phone. Twenty-seven percent of respondents spent between €1 and 5 per month on SMMS, while 15% spent between €5 and 50 per month. This suggests that the typical profile of a respondent in this survey is a person who:

• accesses the Internet via their Smart Phone for less than an hour per day,
• talks on their Smart Phone for less than an hour per day,
• regularly uses their Smart Phone for SMS, but rarely for MMS or email and
• use their Smart Phone to purchase SMMS.

Respondents indicated that they perceived SMMS to be easy to use and not requiring a lot of knowledge or technical skills. Interestingly, respondents preferred M-Payment model is one facilitated through an application provided by banks, whereby the payment would simply be debited automatically from their own bank account, while using their existing MNO to pay for products/services was also rated highly. Respondents displayed significant levels of concern regarding perceived privacy control, the authority and independence of regulatory bodies and in the robustness of the legislative frameworks governing M-Commerce.

Model evaluation

PLS models with reflective constructs have a well-defined and widely accepted validity technique. The list of assessment criteria was first summarised and proposed by Chin (1998). Researchers from different research fields accepted and further adopted these criteria (e.g. Gefen et al. 2000, Tenenhaus et al. 2005, Henseler et al. 2009). The evaluation process of the PLS path model involves two steps. Step 1 necessitates the testing of the quality of the measurement (outer) models. If Step 1 is successful and latent constructs are reliable and valid, Step 2, which necessitates the assessment of the structural (inner) model, should be conducted (Henseler et al. 2009).

The authors employed SmartPLS 2.0 M3 for the PLS model assessments. The online survey produced a sample size of 82 complete and valid responses. Although 82 is a relatively small sample size, it is sufficient to get reliable PLS results. Firstly, it meets a generally accepted ‘10 times’ rule of thumb that defines the minimum sample size as 10 times the most complex relationships in the research model (Chin 1998). The most complex construct in the research model has four predictors of willingness to M-Pay, necessitating a minimum respondent sample size of 40.
Assessment of measurement models

Reliability. The first criterion in the assessment of measurement models is reliability, which traditionally refers to internal consistency reliability and indicator reliability. Internal consistency reliability corresponds to testing either Cronbach’s $\alpha$, which indicates an estimation of the reliability assuming that all items are equally reliable or composite reliability, where different item loadings are taken into account. Although those two reliability measures differ, either of them may be used. Table 4 shows that both parameters have high values (all values are above 0.912), as the requirement value is only required to be above 0.7 in the early
stages of research and above 0.8–0.9 in the advanced stages (Henseler et al. 2009).

Individual reliability of the indicators relies on the expectation that LV variance should explain at least 50% of the indicator. In other words, loadings of manifest variables should not be less than 0.707 (Chin 1998, Gefen et al. 2000, Henseler et al. 2009). Figure 2 demonstrates that the magnitude of all indicators is higher than the required value of 0.707. Based on the two tests, the authors can conclude that all indicators are reliable.

Validity. Convergent validity and discriminant validity examine the validity of four reflective constructs. The first column in Table 5 shows that the average variance extracted (AVE) for all constructs is higher than 0.5, which indicates sufficient convergent validity and means that each LV explains more than 50% of their indicator variance on average. Discriminant validity refers to the appropriate patterns of the inter indicators of a construct and other constructs. First, the variance of a construct should be aligned more with their own indicators than with other constructs. For this purpose, we compared construct cross-correlation and the square root of each construct’s AVE. Table 5 illustrates that all constructs have sufficient discriminant validity since the square root of each latent construct’s AVE (values on the diagonal) is much larger than the correlation of the specific construct with any other reflective construct in our research model.

The authors also tested discriminant validity with a cross-loading test. Table 6 presents results of the test and demonstrates that an indicator of any specific construct has a higher loading on its own construct than on any other constructs. The results of the tests show that manifest variables (indicators) presented in the research model are reliable and valid.

Assessment of the structural model

Explanatory power
Figure 3 presents an overview of the structural model evaluation results. The central criterion for evaluating the structural model is the level of explained variance of the dependent construct willingness to MPay, for which the $R^2$ was 0.534. Thus,

Table 6. Cross loadings.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>MSE</th>
<th>PI</th>
<th>PU</th>
<th>PeU</th>
<th>Trust</th>
<th>WMPay</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSI</td>
<td>MSESOCMED</td>
<td>0.752</td>
<td>0.538</td>
<td>0.294</td>
<td>0.386</td>
<td>0.235</td>
<td>0.234</td>
</tr>
<tr>
<td></td>
<td>MSEGAMES</td>
<td>0.707</td>
<td>0.493</td>
<td>0.423</td>
<td>0.352</td>
<td>0.326</td>
<td>0.325</td>
</tr>
<tr>
<td></td>
<td>SMMDSOCACTIV</td>
<td>0.842</td>
<td>0.513</td>
<td>0.292</td>
<td>0.510</td>
<td>0.387</td>
<td>0.379</td>
</tr>
<tr>
<td></td>
<td>MSESOCACT</td>
<td>0.886</td>
<td>0.484</td>
<td>0.360</td>
<td>0.558</td>
<td>0.396</td>
<td>0.433</td>
</tr>
<tr>
<td></td>
<td>MSETVMED</td>
<td>0.911</td>
<td>0.558</td>
<td>0.287</td>
<td>0.432</td>
<td>0.331</td>
<td>0.358</td>
</tr>
<tr>
<td></td>
<td>MSETVPROG</td>
<td>0.800</td>
<td>0.496</td>
<td>0.339</td>
<td>0.371</td>
<td>0.241</td>
<td>0.297</td>
</tr>
<tr>
<td></td>
<td>MSEMOMUS</td>
<td>0.890</td>
<td>0.614</td>
<td>0.316</td>
<td>0.515</td>
<td>0.253</td>
<td>0.306</td>
</tr>
<tr>
<td>PI</td>
<td>PIEXPERI</td>
<td>0.609</td>
<td>0.928</td>
<td>0.377</td>
<td>0.360</td>
<td>0.297</td>
<td>0.244</td>
</tr>
<tr>
<td></td>
<td>PIFIRST</td>
<td>0.581</td>
<td>0.949</td>
<td>0.426</td>
<td>0.399</td>
<td>0.350</td>
<td>0.338</td>
</tr>
<tr>
<td></td>
<td>PIPEEROPIN</td>
<td>0.596</td>
<td>0.944</td>
<td>0.393</td>
<td>0.466</td>
<td>0.396</td>
<td>0.376</td>
</tr>
<tr>
<td>PU</td>
<td>PUPROD</td>
<td>0.303</td>
<td>0.385</td>
<td>0.896</td>
<td>0.373</td>
<td>0.219</td>
<td>0.326</td>
</tr>
<tr>
<td></td>
<td>PUEFFPA</td>
<td>0.346</td>
<td>0.393</td>
<td>0.909</td>
<td>0.287</td>
<td>0.376</td>
<td>0.435</td>
</tr>
<tr>
<td></td>
<td>PUEFFWA</td>
<td>0.406</td>
<td>0.356</td>
<td>0.858</td>
<td>0.380</td>
<td>0.166</td>
<td>0.339</td>
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<tr>
<td></td>
<td>PUACCOMP</td>
<td>0.353</td>
<td>0.378</td>
<td>0.895</td>
<td>0.263</td>
<td>0.351</td>
<td>0.356</td>
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<tr>
<td>PEU</td>
<td>PEEASY</td>
<td>0.588</td>
<td>0.508</td>
<td>0.318</td>
<td>0.891</td>
<td>0.367</td>
<td>0.412</td>
</tr>
<tr>
<td></td>
<td>PEKNOW</td>
<td>0.448</td>
<td>0.350</td>
<td>0.348</td>
<td>0.942</td>
<td>0.303</td>
<td>0.394</td>
</tr>
<tr>
<td></td>
<td>PETECH</td>
<td>0.450</td>
<td>0.317</td>
<td>0.339</td>
<td>0.932</td>
<td>0.322</td>
<td>0.367</td>
</tr>
<tr>
<td>Trust</td>
<td>PCEXPERT</td>
<td>0.271</td>
<td>0.290</td>
<td>0.289</td>
<td>0.353</td>
<td>0.770</td>
<td>0.576</td>
</tr>
<tr>
<td></td>
<td>PECETHIC</td>
<td>0.250</td>
<td>0.237</td>
<td>0.162</td>
<td>0.319</td>
<td>0.884</td>
<td>0.549</td>
</tr>
<tr>
<td></td>
<td>PINTHONEST</td>
<td>0.417</td>
<td>0.425</td>
<td>0.324</td>
<td>0.256</td>
<td>0.847</td>
<td>0.540</td>
</tr>
<tr>
<td></td>
<td>PPCCONFEPRIV</td>
<td>0.328</td>
<td>0.279</td>
<td>0.263</td>
<td>0.324</td>
<td>0.925</td>
<td>0.626</td>
</tr>
<tr>
<td></td>
<td>LFROBUST</td>
<td>0.285</td>
<td>0.289</td>
<td>0.260</td>
<td>0.283</td>
<td>0.876</td>
<td>0.539</td>
</tr>
<tr>
<td></td>
<td>PSCPERSDATA</td>
<td>0.390</td>
<td>0.392</td>
<td>0.302</td>
<td>0.354</td>
<td>0.828</td>
<td>0.716</td>
</tr>
<tr>
<td></td>
<td>REGAUTH</td>
<td>0.273</td>
<td>0.260</td>
<td>0.265</td>
<td>0.207</td>
<td>0.739</td>
<td>0.392</td>
</tr>
<tr>
<td>WMPay</td>
<td>PPRMNO</td>
<td>0.362</td>
<td>0.313</td>
<td>0.393</td>
<td>0.415</td>
<td>0.674</td>
<td>0.932</td>
</tr>
<tr>
<td></td>
<td>PPRSAFE3RD</td>
<td>0.383</td>
<td>0.352</td>
<td>0.307</td>
<td>0.345</td>
<td>0.582</td>
<td>0.897</td>
</tr>
<tr>
<td></td>
<td>PPRSAFECC</td>
<td>0.401</td>
<td>0.324</td>
<td>0.389</td>
<td>0.459</td>
<td>0.651</td>
<td>0.960</td>
</tr>
<tr>
<td></td>
<td>PPRSARFELASER</td>
<td>0.388</td>
<td>0.307</td>
<td>0.449</td>
<td>0.378</td>
<td>0.655</td>
<td>0.958</td>
</tr>
</tbody>
</table>
the model explained 53.4% of the construct’s variance. The variance of the construct was explained at the moderate level consistent with Chin’s (1998) criteria. R² values of 0.67, 0.33 or 0.19 for endogenous LVs are substantial, moderate or weak, respectively (Chin 1998, p. 323).

In addition, within the research model, MSE and PI explain 31.4% of the PEU variance, while the variance of PU is explained by PI (18.1%).

The study explored changes in R² to investigate the substantive impact of each independent construct on the dependent constructs, carrying out the effect size technique by re-running three PLS estimations, excluding in each run, one of the explaining latent constructs. Table 7 represents a summary of the quantitative results of the effect size test. Chin (1998) proposed to use the effect size f² of PLS constructs, which similar to Cohen’s implementation for multiple regression might be small (f² = 0.02), medium (f² = 0.15) and large (f² = 0.35).

The results of the effect size (Table 7) show that while PEU and PU have small effects (with f² equals to 0.026 and 0.047, respectively), on consumers’ willingness to use a Smart Phone to make an M-Payment, Trust has a large effect with magnitude of f² = 0.545.

Table 7. Effect size test.

<table>
<thead>
<tr>
<th>Construct</th>
<th>R² incl</th>
<th>R² excl</th>
<th>f²</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>0.534</td>
<td>0.280</td>
<td>0.545</td>
<td>Large</td>
</tr>
<tr>
<td>PU</td>
<td>0.534</td>
<td>0.512</td>
<td>0.047</td>
<td>Small</td>
</tr>
<tr>
<td>PeU</td>
<td>0.534</td>
<td>0.522</td>
<td>0.026</td>
<td>Small</td>
</tr>
<tr>
<td>PI</td>
<td>0.534</td>
<td>0.531</td>
<td>0.006</td>
<td>–</td>
</tr>
<tr>
<td>MSI</td>
<td>0.534</td>
<td>0.531</td>
<td>0.006</td>
<td>–</td>
</tr>
</tbody>
</table>

Table 8. Blindfolding test for predictive relevance.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Σ SO</th>
<th>Σ SE</th>
<th>Q²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>324</td>
<td>279.10</td>
<td>0.14</td>
</tr>
<tr>
<td>PeU</td>
<td>243</td>
<td>183.17</td>
<td>0.25</td>
</tr>
<tr>
<td>WMPay</td>
<td>324</td>
<td>172.12</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Predictive power

Employing the bootstrapping re-sampling technique, using the SmartPLS software, enabled a test for the statistical significance of the path coefficients. The evaluation of the structural model shows that all path coefficients were highly statistically significant (Figure 3). The study found that, Trust (H1 supported with β = 0.569 and p < 0.001), PU (H3b supported with β = 0.171 and p < 0.001), and PEU (H3a supported with β = 0.136 and p < 0.001) positively affect consumers’ willingness to use a Smart Phone to make an M-Payment.

Personal Innovativeness positively affected both PEU (H1a supported with β = 0.153 and p < 0.01), and PU (H1c supported with β = 0.425 and p < 0.001).

Mobile self-efficacy positively affected PEU (H4a supported with β = 0.452 and p < 0.001). However, impacts of both MSE and PI on consumers’ willingness to use a Smart Phone to make an M-Payment were found to be statistically insignificant (H2b and H4b are not supported).

The authors performed the Stone and Geisser Q² test for the evaluation of the predictive relevance of the structural model. Chin (1998) stated that Q² reflects an index of goodness of reconstruction by model and parameter estimations. A positive Q² provides evidence that the omitted observations were well-reconstructed and that predictive relevance is achieved, while a negative Q² reflects absence of predictive relevance. Table 8 shows that all values of Q² were greater than zero, indicating predictive relevance for the endogenous constructs of the research model.

Discussion and conclusions

By exploring consumers’ willingness to use Smart Phones to make M-Payments, this paper makes a
number of significant theoretical and practical contributions of value to both researchers and practitioners. Both of these will now be discussed.

**Theoretical contribution**

Consumer intention to use Smart Phones for transactional services and M-Payment is of scientific and practical interest. In this study, we sought to extend the theoretical knowledge of M-Payment adoption, by developing a model explaining consumers’ willingness to use Smart Phones to make M-Payments. Indeed, this paper makes a number of theoretical contributions to the M-Payments literature. Firstly, it contributes a conceptual model for exploring consumer’s perceptions of M-Payments and in developing same several factors which had not been previously been applied to the M-Payments domain were incorporated. The study adopted and empirically tested a number of constructs previously recognised in extant literature as being influential in consumers’ decision to adopt mobile advertising, mobile marketing, LBS, mobile banking, M-Commerce, and E-Commerce in general. These constructs have previously not been used in a single study focusing on the willingness of European consumers to use Smart Phones to make M-Payments. Four main hypotheses (divided into a number of sub-hypothesis) were proposed and the results provide strong support for the theoretical predictions. Several implications for theory were identified from these results.

Viehland and Yoong Leong (2010) state that PEU and trust impact on consumers’ WMPay using a Smart Phone. However, both factors are treated the same with no differentiation being made between these factors. The results from this study extend extant research by clearly differentiating between these factors in terms of impact, illustrating that trust is the critical factor in explaining consumers’ WMPay using Smart Phones, while the impact of PEU is significantly less. This is significant as it contradicts the findings of Schierz et al. (2010), which suggest that ease of use is very important for M-Payment services, which compete with established payment solutions, and thus need to provide benefits when it comes to ease of use. Our findings show that although PEU is important, it is not actually a key factor in explaining the slow diffusion of M-Payments using Smart Phones.

While Lee et al. (2011) found that MSE had a significant impact on consumers’ willingness to adopt mobile advertising, the results of this study clearly illustrate that MSE has only a small impact on consumers’ willingness to use a Smart Phone to make an M-Payment. However, the results show that MSE does have a significant impact on PEU. This is consistent with the findings of Chen et al. (2011). These results may indicate that while consumers are convinced of the ease of use of SMMS, they still harbour suspicion and significant concerns about making an M-Payment using a Smart Phone. The authors strongly recommend that future studies should develop and test more extensive measures of MSE as it relates to M-Payments, given the vast number of SMMS available to consumers and the difficulties their inherent differences pose in measuring MSE in an M-Commerce environment.

Agarwal and Prasad (1998) validated PIIT for characterising technology adoption. Previous studies of the impact of PI on mobile marketing (Bauer et al. 2005) and mobile LBS (Gupta et al. 2011) indicated that it influences the adoption of both types of SMMS. This study reveals, however, that although PI strongly influences consumers’ perceptions of the usefulness of a Smart Phone to make an M-Payment, PI has very little direct impact on consumers’ willingness to use a Smart Phone to make an M-Payment. Personal innovativeness also has a small impact on consumers’ PEU of a Smart Phone to make an M-Payment. Thus, while our study does not reflect the findings of Gupta et al. (2011), further research could consider the moderating effects of PI, similar to Agarwal and Prasad (1998), rather than the direct impact on consumers’ WMPay. As previously stated, M-Payments are still in their infancy in Europe, and clearly established mechanisms have yet to emerge. Thus, future studies could reflect upon the differentiation of innate PI and actual PI by Im et al. (2003) and measure actual adoption of M-Payments.

**Implications for practice and future research**

Smart Phones present organisations with a significant amount of commercial opportunities. For commercial organisations to avail of such opportunities, an understanding of consumer’s perceptions of Smart Phones is of paramount importance. Yet, both the practitioner and academic literature, particularly in a European context, are immature in explaining consumer adoption of M-Payments using Smart Phones.

The findings of this study present conclusive evidence that trust is the single most important factor influencing consumers’ willingness to use Smart Phones to make M-Payments. Perceived usefulness and PEU do influence the payment decision, but they are less important, while MSE and PI have almost no impact. It is clear then that, irrespective of individuals’ displaying high levels of PI, or MSE, and irrespective of whether the SMMS is perceived to be useful and easy to use, consumers will not make M-Payments
unless they are convinced of the payment reliability of the Smart Phone M-Payment system.

Our analysis illustrates that consumer’s perceptions of privacy controls, legal frameworks and the regulation of these frameworks are integral parts of trust in an M-Commerce environment and critical for consumers’ willingness to use Smart Phones to make M-Payments. Similar to the study of consumer acceptance of online services by Roca et al. (2008), perceived privacy control emerges in this study as a critical factor in consumers’ willingness to use Smart Phones to make an M-Payment. These findings are very important for practitioners, and a number of suggestions can be purported through interpreting our findings. Firstly, commercial entities need to communicate to consumers that they implement policies and employ the latest technologies to protect the privacy and data of consumers. For government and commercial entities who wish to develop an M-Payment culture, the authors suggest that these entities review their legal frameworks, with the goal being to ensure that they are adequate to protect consumers. Furthermore, consumers’ perception of regulatory bodies having sufficient powers to take action against service providers who do not adhere to such frameworks is an issue requiring further detailed research.

The authors advise that it is possible that PEU may become a more important mitigating factor as M-Payment services become more established, and consumers’ have a greater choice of which M-Payment model to actually use, because the preferred M-Payment model for Irish consumers is one facilitated through an application provided by banks, whereby the payment would simply be debited automatically from their own bank account. Thus, it is possible that PEU may in future actually influence consumers’ choice of which M-Payment model to use, rather than their decision to use a Smart Phone to make an M-Payment. The authors therefore recommend that as M-Payment models mature and consumers’ have a greater choice of which M-Payment models to adopt, further studies investigate PEU between the offerings in more detail.

Although this paper reveals important findings for the development of theoretical models and practitioners alike, nevertheless, there are a number of limitations to this study. The sample size represents a limitation of the study, with findings based on 82 respondents participating in the study. Therefore, further research needs to be conducted to re-examine the model with a larger sample size. Furthermore, the majority of respondents to this survey were aged between 30 and 50 years; thus, future research could consider a multigroup analysis to see if the model is invariantly consistent (e.g. across gender and age groups). This research also is limited to Smart Phone consumers in Ireland, thus a wider European study is required. The authors are currently completing further research to investigate the explanatory power of the model for different sociodemographic groups and for specific products/services. Such research may provide further insight on the impact of PEU on M-Payments. Furthermore, steps are underway to further test the model in the context of evaluating consumer adoption of the various M-Payments models available using Smart Phones.

**Note**

1. The t-test for each path coefficient was conducted with \( n-1 \) degrees of freedom, where \( n \) is a number of subsample repetitions in bootstrapping procedure; 300 repetitions were chosen resulting in 299 degrees of freedom.

**References**


