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Routledge
Taylor & Francis Group

The International Review of Retail, Distribution and Consumer Research

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rirr20

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To cite this article: Jamie Mew & Elena Millan (2021): Mobile wallets: key drivers and deterrents of consumers' intention to adopt, The International Review of Retail, Distribution and Consumer Research, DOI: 10.1080/09593969.2021.1879208

To link to this article: https://doi.org/10.1080/09593969.2021.1879208

Published online: 09 Feb 2021.

THE INTERNATIONAL REVIEW OF RETAIL, DISTRIBUTION AND CONSUMER RESEARCH
https://doi.org/10.1080/09593969.2021.1879208

Mobile wallets: key drivers and deterrents of consumers' intention to adopt

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ABSTRACT

Mobile wallets are one of the latest innovations with a considerable potential to change how consumers make purchases and enhance their shopping experiences. However, their diffusion has been much slower than initially anticipated, particularly in countries such as the UK where the present study was conducted. The services offered by the mobile wallet have to be secure, reliable, and constantly available. Any problems during mobile wallet use are likely to affect consumers' perceived value and level of satisfaction with the service providers. This study identifies key drivers and deterrents of a mobile wallet adoption. The study utilizes a mixed-method research design to gain deeper insights and understanding of the studied phenomena. Accordingly, the study findings are firmly grounded in empirical evidence. The conceptual model blends existing with new ideas emanating from the real-life experiences of the study participants. Our findings confirm the important role of all factors considered in the model: they affected directly and/or indirectly consumers' intention to adopt the mobile wallet and explained a substantial portion of its variance. In addition to enriching existing knowledge on consumer behavior toward innovations, our findings provide valuable insights to marketers and retailers by helping them make effective decisions regarding the use of this recent innovation for the benefit of all stakeholders involved.

ARTICLE HISTORY
Received 17 October 2019
Accepted 18 January 2021

KEYWORDS
Mobile wallets' adoption; consumer behavior; personal innovativeness in IT; perceived usefulness and relative advantage; perceived security and trust

Introduction

Information technology has become an indispensible part of people's daily lives. The mobile wallet, one of the recent innovations, is an application on a mobile device allowing individuals to store and use payment and loyalty cards, pay their bills, make peer-to-peer-payments, issue cheques, store e-receipts, and use coupons directly from the application. The transactions are to be conducted in a convenient, easy and time saving manner (Kumar, Anand, and Song 2017; Patel 2013). It has been argued that convenience, cost, and record keeping are key benefits defining consumers' payment preferences (Schuh and Stavins 2015). Mobile wallets could also be used to store in an encrypted or password protected format sensitive personal information, such as passports, PIN codes, online

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*__Authorship statement__: Both authors contributed equally to this manuscript.

shopping accounts, booking details, and insurance policies (Shin 2009). Thus, the mobile wallet has the potential to eliminate the need to carry a traditional wallet, or even a bag.

The mobile wallet could offer a number of benefits to businesses too. For financial institutions, it provides another way for consumers to pay for goods, thus potentially opening up a new revenue stream, if the mobile wallet is used instead of cash. For online businesses, such as Google, the mobile wallet provides valuable data generated from consumers using it for payments. The integration of data from online and offline purchases could result in much better targeted personalized marketing campaigns, thus increasing their effectiveness and impact, while at the same time providing more value to their customers (Grewal, Roggeveen, and Nordfält 2017; Savitz 2013). Mobile wallets have the potential to transform the future retail payments' scene in the same way in which the introduction of debit and credit cards did in the 1950s and 1960s. Faster in-store payments and convenient electronic storage of receipts from transactions, as well as reduced wait times, are likely to increase consumer satisfaction and encourage offline shopping. Besides, personalized and just-in-time promotions via the mobile wallet could result in paying lower prices and thus getting better value for money for the goods and services bought.

Consumers' adoption of mobile wallets varies considerably across markets. While China and India are leading the mobile wallet adoption worldwide (65% and 61% of surveyed consumers used mobile wallets, respectively), Western countries such as the UK and the USA are still in the early stages of its adoption (UK 12%, USA 16%) (yStats.com 2019). With the global market expected to grow substantially, from a market valuation of 880 USD billion in 2017 to 9,352 USD billion by 2026 (ResearchAndMarkets 2018), there is significant value in trying to unlock the low levels of adoption in Western markets.

With regard to the UK mobile wallet market – the context of the present research – recent industry research reported that the primary barrier for its adoption in this country is the lack of users' interest, with 39% of surveyed consumers stating that the idea of paying with a phone was not appealing to them, 22.5% questioning the advantage of the mobile wallet over plastic cards or cash, and a further 16.5% expressing security concerns over payment details if the phone is lost or stolen (yStats.com 2019). The lack of perceived relative advantage is mainly due to the fact that contactless credit and debit cards of trusted service providers have advanced faster than the mobile payments' trend (Fisher 2019). Among the leading service providers of mobile wallets in the UK are Apple Pay, Google Pay, Samsung Pay and PayPal.

To date the focus of most of the existing studies of relevance to this research has been on consumers' adoption of mobile payments. These studies have explored the effects of factors such as perceived usefulness, ease of use, security, and social influence (e.g. Schierz, Schilke, and Wirtz 2010; Yang et al. 2012). However, mobile payments are only one feature of the mobile wallet. Its additional features (e.g. electronic versions of one's driving license, health insurance card, loyalty program identification) may provide more reasons for adopting it beyond the mobile payment option. Given the relative recency of the mobile wallet innovation and the still fragmentary knowledge of the determinants of its adoption, more research is needed to shed light on the drivers and barriers for the mobile wallet use. What is more, in view of the vastly different levels of adoption rates across countries and the fact that the majority of research thus far has been focused on Asian and African markets (see Jain and Singhal 2019), more research focused on Western consumers is needed.

Building on the TAM and the Unified Theory of Acceptance and Use of Technology (UTAUT), as well as relevant research in the mobile wallets' domain, the present research develops its own model, which considers a number of antecedent and mediator factors likely to influence behavioural intention (BI) to adopt a mobile wallet, namely: personal innovativeness in information technology (PIIT); perceived usefulness (PU); attitude (ATT); social influence (SI); perceived security (PS); trust (TR); and perceived relative advantage (PRA) of using a mobile wallet over a traditional one.

The present study addresses the following research objectives: first, to identify key factors influencing consumers' intention to adopt a mobile wallet and to develop hypotheses drawing from relevant theoretical domains and empirical evidence; second, to test the developed conceptual model with primary data collected for the purpose of this study; and third, to provide valuable recommendations to retailers and other businesses and academic researchers on how to tackle the diverse issues and challenges related to the adoption of this innovation.

The contribution of this research is evidenced by its results. Namely, the study found significant direct effects and in the anticipated directions of all but two factors (TR and PIIT) on intention to adopt a mobile wallet. What is more, the effects of TR and PIIT were fully mediated, for TR by ATT, and for PIIT by PU, PRA and ATT. These fully mediated effects indicate that the way TR and PIIT influence adoption intention in the mobile wallet context may differ from other IT innovations, including also mobile payments (e.g. Shin 2009) and mobile credit cards (Tan et al. 2014). These findings support the explanatory power of the study conceptual model. Our research extends the existing knowledge with regard to key antecedent and mediating variables able to explain better the mechanisms behind consumers' adoption of the mobile wallet. This innovation has considerable potential to change consumers' shopping experiences and their retail patronage behavior, as well as the future retail payments' landscape; hence, the importance of exploring this research topic. What is more, the study addresses the pressing need for additional inquiries into Western contexts (see Jain and Singhal 2019), as well as areas in which innovations will reshape the retail landscape in the future (see Grewal, Roggeveen, and Nordfält 2017).

The rest of the paper is organized as follows. The theoretical grounds and the development of the study hypotheses are discussed next, then the adopted mixed-method research design is presented. Following this discussion the analysis of both qualitative and quantitative data is presented. The study results are then discussed and linked to existing literature in relevant research areas., followed by the managerial and research implications of the study findings. The limitations and directions for future research are discussed and finally the conclusions.

Conceptual framework and study hypotheses

TAM, UTAUT and other relevant frameworks

TAM and UTAUT are two key conceptual frameworks of IT innovations adoption. TAM explains and predicts user acceptance of information systems (Davis 1989). It draws from Azjen and Fishbein (1975) Theory of Reasoned Action (TRA). According to TRA, a person's intention to perform a behavior is the immediate determinant and best predictor of whether a person will carry out the behavior. TRA also states that BI is determined by

two factors: a person's attitude toward the behavior (e.g. to adopt an innovation) and a person's perception of the social pressures to perform the behavior (i.e. subjective norms). TRA has been adapted within TAM to account for specific factors that influence IT adoption in a work setting. As a result, TAM dropped subjective norms from the model. The model was further modified by adding two determinants of attitude, namely, PU, defined as how much using an IT innovation enhances one's job performance, and Perceived Ease of Use (PEOU), defined as how free of effort a person believes using the innovation is. PEOU was not included in the conceptual model of the present research because it examines consumers' intention to adopt a mobile wallet on the basis of their understanding of the concept without requiring prior experience with it. Besides, PEOU was not significantly different across the six different retail technologies studied by Inman and Nikolova (2017).

In the mobile wallet context, Shaw (2014) extended the TAM by incorporating in the model additional determinants of PU and PEOU (i.e. self-efficacy and information learning), as well as of behavioral intention (BI) (i.e. trust and informal learning). The study findings provide some useful insights about the direct effects of the antecedent variables on BI, as well as the mediating role of trust on the effect of informal learning on intention to use a mobile wallet. However, as TAM was originally developed to explain IT adoption in work settings, this model can only partially explain IT adoption, particularly among individual end users. Consequently, social influence, attitude and other potential determinants of end users' BI for mobile wallets' adoption have not been considered in Shaw's model.

More recently, UTAUT was developed (Venkatesh et al. 2003). One of the key advancements of UTAUT model over TAM is the inclusion of social influence. The effects of both attitude and social influence on BI to adopt a mobile wallet are considered in the conceptual model of the present study.

In the context of mobile payments, Shin (2009) made some adaptations to UTAUT by including PU and PEOU as antecedents of attitude toward a mobile payment, and the latter together with social influence, self-efficacy, perceived security, and trust were linked to intention to use a mobile payment. From the tested relationships the anticipated effects of social influence and self-efficacy were not confirmed. What is more, no hypotheses about the mediating role of attitude were specified. Our research goes beyond the focus on direct effects of SI, PS and TR on BI by considering additional mediating effects (see the discussion of the hypotheses further below). We also consider the mediating role of attitude on the effect of PU on BI, which has not been done in Shin's (2009) study. Lastly, in our research the mobile wallet concept was defined in a more comprehensive fashion beyond its mobile payment function.

Lastly, outside of these two popular theoretical frameworks, a recent study by Mombeuil (2020) examined the effects of relative convenience, relative advantage, perceived privacy and perceived security on renewed adoption of mobile wallets by African students, with a focus on mobile payments. However, in addition to considering a relatively small number of variables in its model, the study does not account for any intervening effects.

Study hypotheses

The focus here is on the development of the study hypotheses. Further theoretical arguments and empirical evidence are discussed in support of the research propositions. The conceptual model with the study hypotheses is presented in Figure 1.

The effect of ATT on BI to adopt a mobile wallet

Ajzen and Fishbein (1977) define *attitude* as an overall appraisal of a behavior outcome measured by one's beliefs and evaluations of the consequences of that behavior. TRA postulates that an attitude toward an action is likely to lead to intention to enact a specific behavior because people assess the implications of performing the behavior. If the expected outcome is positive (negative), then the individual will intend to perform (avoid) this behavior. Several studies on adoption of IT innovations (other than mobile wallets), provide support for the positive effect of attitude on BI (e.g. Yang and Yoo 2004; Schierz, Schilke, and Wirtz 2010). Therefore:

H1. ATT toward using a mobile wallet has a positive effect on BI to adopt this innovation.

The effects of PU on ATT and BI to adopt a mobile wallet

For the purpose of the present study, PU is defined as the value that using a mobile wallet can bring to its users. If consumers do not perceive clear benefits from using a new

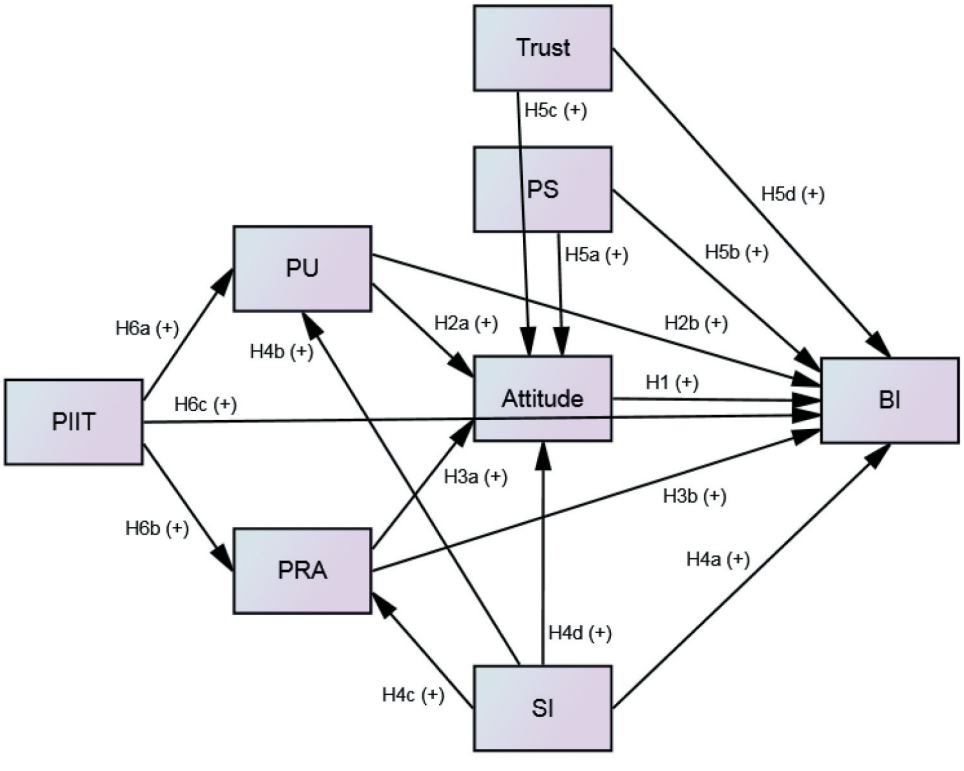

Figure 1. Conceptual model of behavioral intention to adopt a mobile wallet.

technology to justify the additional costs and risks related to its acquisition, then they are less likely to form a positive attitude toward the technology and ultimately to adopt it. Indeed, the lack of a clear value proposition from the mobile wallet providers and other stakeholders in this technology value chain as to what needs the mobile wallet can satisfy and what solutions it can offer to any existing problems appears to be a key deterrent for mobile wallets' adoption (see Hempel 2014). Within TAM, a direct link of PU to both attitude and BI has been proposed. The logic behind these two effects of PU is that intention to adopt an IT may be driven by a cognitive evaluation of improved performance as a result of IT use, without necessarily the involvement of liking in the intention formation process. Previous research found that PU positively influenced attitude toward using an IT technology (Schierz, Schilke, and Wirtz 2010; Shin 2009). Evidence also supports the positive effect of PU on BI (Agarwal and Prasad 1998; Slade et al. 2015; Tan et al. 2014). Similarly, Shaw's (2014) study, conducted in the mobile wallet context, reported a positive effect of PU on intention to use this innovation. Thus:

H2. PU has positive effects on (a) ATT toward using a mobile wallet, and (b) BI to adopt a mobile wallet.

The effects of PRA on ATT and BI to adopt a mobile wallet

Within the Diffusion of Innovations theory, Rogers (2003, p. 229) defines PRA as 'The degree to which an innovation is perceived as being better than the idea it supersedes.' He argues that the adoption process is influenced, among other things, by PRA. The relative advantage of mobile payments – one aspect of the mobile wallet – includes the convenience of people always carrying their mobile phones with them, and thus not needing to carry payment cards or cash if they could pay using their phones (Mallat 2007). As the mobile wallet allows users also to store and use other types of cards, there is no need to carry them as well. Hence, the relative advantage of a mobile over a conventional wallet is that the person would not need to carry a physical wallet at all. What is more, the offers received by consumers directly to their phones instead of the traditional offers from firms (i.e. coupons or regular retail offers) can be much better tailored to individual needs, which allows firms to establish direct, and possibly stronger, relationships with their target audiences.

This study anticipates positive effects of PRA on both attitude and BI. The relationship between PRA and attitude is straightforward – if consumers perceive an innovation to have a relative advantage, then they would view it in a positive manner. Consistent with this notion, Teo and Pok (2003) found a significant effect of PRA on attitude in the context of wireless application protocol (WAP)-enabled mobile phone adoption. As to the link between PRA and BI, according to Rogers (2003), an innovation with a high level of relative advantage will have a rapid rate of adoption. A person may intend to adopt an innovation due to various advantages it has over alternative products, such as economic advantage (i.e. better value), and social status advantage (i.e. the innovation provides greater status benefits than other alternatives). Consistent with this argument, Arts, Frambach, and Bijmolt (2011) and Hameed, Counsell, and Swift (2012) reported that PRA was a significant factor in the innovation adoption process. Similarly, Yang et al. (2012) and Mombeuil (2020) found that PRA influenced BI to adopt mobile payment or wallet services. Thus:

H3. PRA has positive effects on (a) ATT toward using a mobile wallet, and (b) BI to adopt a wallet.

The effects of SI on PU, PRA, ATT and BI to adopt a mobile wallet

In the IT context, SI is defined as 'the extent to which consumers perceive that important others (e.g. family and friends) believe they should use a particular technology' (Venkatesh, Thong, and Xu 2012, p. 159). Complying with others' expectations could be due to a strong need for acceptance and fitting in a particular reference group, which already uses the IT (Bock et al. 2005). A desire to enhance one's public image or social status among important social referents can also influence his/her intention to adopt an innovation (Dholakia and Talukdar 2004). In the mobile wallet context, the effect of SI on BI may be more pronounced due to heightened anxieties emanating from the uncertainties and risks associated with the adoption of the new technology (Slade et al. 2015). In financial mobile application adoption studies, SI has been positively linked to intention to adopt mobile banking (Zhou, Lu, and Wang 2010), mobile payments (Slade et al. 2015; Yang et al. 2012), and mobile credit cards (Tan et al. 2014).

SI may also affect PU, PRA, and ATT. Important others can influence individual decisions not only through normative pressures, but also through sharing of information and personal experiences with the new IT. Social interactions can shape individual beliefs about the benefits an innovation can offer, as well as overall attitudes. This logic draws from the susceptibility to interpersonal influence framework, according to which social influences have normative and informational dimensions (Bearden, Netemeyer, and Teel 1990). The advice of important others may be even more valued in the context of innovations' adoption, due to the complexities of the innovative products, as well as the higher uncertainties and risks associated with their acquisitions. This reasoning is supported by Hong and Tam (2006), who reported a significant positive effect of SI on PU. The expected positive effect of SI on PRA is confirmed by Yang et al. (2012) for their potential adopters' sample, as is the sample of the present study. Furthermore, the importance of SI in shaping attitudes in the context of IT is also supported (Crespo and Rodriguez 2008; Schierz, Schilke, and Wirtz 2010). Thus:

H4. SI has positive effects on (a) BI to adopt a mobile wallet, (b) PU, (c) PRA, and (d) ATT toward wallet.

The effects of PS and trust on ATT and BI to adopt a mobile wallet

The mobile wallet is intended to store very sensitive personal and financial information; hence, PS and trust are likely to play a key role for its adoption in terms of speed and scope, and ultimately for its success. PS is defined here as the extent to which consumers believe they are protected during a mobile wallet use. In the context of mobile wallet technologies, security and privacy have been identified as key barriers for the mobile wallets' adoption (Patel 2013). Security concerns are likely to deter the adoption of the mobile wallet, due to people's anxieties about who from the stakeholders will have access to their very personal and sensitive information stored in it, and how this information will be used (Euromonitor). Another key security concern relates to a scenario when a smartphone has been lost, stolen or hacked, and someone else ends up using the mobile wallet functions (Mallat 2007).

This study also anticipates that higher security concerns over a mobile wallet use will lead to less positive overall attitude. When people evaluate if the use of a mobile wallet is a good idea or not, PS risks are likely to influence their overall evaluation based on weighing the pros (i.e. benefits) and cons (e.g. security risks). This logic is supported by Schierz, Schilke, and Wirtz (2010), who found a positive effect of PS on ATT toward using mobile payment services. Shin (2009) and Mombeuil (2020) studies, as well as other research conducted in contexts different from the mobile wallet technology (Lu et al. 2011; Liébana-Cabanillas, Sánchez-Fernández, and Muñoz-Leiva 2014; Yang and Yoo 2004), reported a significant effect of perceived security or risk on BI. In contrast, a few other studies failed to find a significant relationship (Tan et al. 2014; Wang and Yi 2012). Thus:

H5(a/b). PS has positive effects on (a) ATT toward using a mobile wallet, and (b) BI to adopt a wallet.

Trust is defined here as an individual's confidence that the mobile wallet is secure and works as expected, confidence in the mobile wallet service provider for providing a product, which functions as expected, as well as in the retailers that they will accurately process the transactions (Mallat 2007; Shin 2009). Trust is important in the adoption of new technologies, such as e-commerce (Dennis et al. 2009; Toufaily, Souiden, and Ladhari 2013), mobile payments (Lu et al. 2011), and mobile commerce (Zhang, Zhu, and Liu 2012). For their peace of mind, people need to have trust in the secure use of the mobile wallet, as well as in the honesty and dependability of the different parties involved in the transaction process – they expect the different stakeholders to fulfill their promises and to keep safe and secure transaction details and other private information. Consistent with this reasoning, Shaw (2014) reported a positive effect of trust on BI in the context of mobile wallet technology.

This study also anticipates a positive effect of TR on ATT. Regardless of whether trust is personality-, cognition-, knowledge-, institution-based, or based on calculation of costs and benefits (Gefen, Karahanna, and Straub 2003), having more trust in an IT indicates that people have higher expectations for gaining benefits (i.e. for positive outcomes) from its use and for avoiding risks and losses; hence, they will have a more positive attitude toward the IT. Consistent with this notion, Wu and Chen (2005) reported a positive effect of trust on attitude to use online tax. Similarly, Grazioli and Jarvenpaa (2000) found a positive effect of trust on attitude toward shopping at a web store. Evidence from other studies on the adoption of IT innovations (e.g. web survey participation, mobile payment) reported positive effects of trust on both attitude and BI (Fang, Shao, and Lan 2009; Shin 2009). Thus:

H5(c/d). TR has positive effects on (c) ATT toward using a mobile wallet, and (d) BI to adopt a wallet.

The effects of PIIT on PU, PRA and BI to adopt a mobile wallet

Within the Diffusion of Innovations theory, Rogers (2003) argues that the extent to which an individual is innovative is likely to influence the adoption process. Building on this theory, Agarwal and Prasad (1998, p. 206) define PIIT as 'the willingness of an individual to try out any new information technology.' According to Yi et al. (2006, p. 357), innovators

find it easier to 'imagine, understand and appreciate the benefits of an innovation' and have the ability to visualize better the potential advantages to be gained from its use. Individuals high on PIIT may perceive a new IT technology as more useful because they are more likely to seek information about it and to experiment with it. Since innovators have adopted the preceding IT earlier than the rest of its users, they have more extensive experience with the IT which is to be replaced, as well as might have used more of its features. Thus, innovators are likely to have greater knowledge of the PU of the new technology, as well as to identify more easily its PRA. In line with this logic, a positive effect of PIIT has been reported on PU of a new IT (Lewis, Agarwal, and Sambamurthy 2003), wireless Internet services via mobile technology (WIMT) (Lu, Yao, and Yu 2005), NFC enabled mobile credit cards (Leong et al. 2013), and mobile commerce (Yang 2005). As to the relationship between PIIT and PRA, Yang et al. (2012) found a positive effect of PIIT on PRA of adopting mobile payment services.

Regarding the effect of PIIT on BI, with mobile wallets being a relatively recent innovation, consumers may still have a limited knowledge about it. Thus, PIIT may have also a direct effect on BI with regard to this innovation. Evidence from studies on the adoption of other IT innovations (e.g. mobile payment services, mobile credit cards, wireless mobile data services) supports this line of reasoning (Jun, Cho, and Park 2018; Tan et al. 2014; Lu et al. 2008). Thus:

H6. PIIT has positive effects on (a) PU, (b) PRA, and (c) BI to use a mobile wallet.

Lastly, the above discussion and its representation in Figure 1 draw attention to possible mediation effects, in addition to the argued direct effects of the predictor factors. The rationale for these mediation effects derives from the more recent developments in the mediation literature (e.g. Hayes 2009; Zhao, Lynch, and Chen 2010; Rucker et al. 2011), according to which a significant indirect effect *a x b* established by a bootstrap test is sufficient to demonstrate mediation. Given the anticipated effects of PU, PRA, SI, PS, and TR on ATT, and of ATT on BI, ATT is likely to mediate the effects of these five predictors of BI. Also, in view of the hypothesized effects of SI and PIIT on PU and PRA, and of PU and PRA on both ATT and BI, a further proposition is made about these mediation effects of PU and PRA. Thus:

H7. ATT mediates the effects of (a) PU, (b) PRA, (c) SI, (d) PS, and (e) TR on BI to use a wallet.

H8. PU and PRA mediate the effects of (a) SI and (b) PIIT on (c) ATT and (d) BI to use a wallet.

Study methodology

This study utilized a mixed-method research design, including four focus groups (FGs) and an online survey. The insights gained from the literature review and the focus groups informed the development of the survey questionnaire. The focus groups' textual data also provided contextualized understanding of the mobile wallet's adoption.

Qualitative method

The data collection was conducted in the UK. The FGs comprised four or five participants each – in total 18 participants took part in the discussions. Due to the novelty of the research topic, the FGs were relatively small to ensure that key issues were discussed in sufficient depth. A combined convenience and snowball sampling strategy was used to recruit the study participants. Since the aim of the qualitative part of the research was not to generalize but rather to provide insights and contextualized understanding of the studied phenomena, this sampling method was deemed suitable for the purpose. It also allowed us to tackle some time and budget constraints. The participants were contacted via different channels, such as face-to-face, phone, email and social media. Male and female genders were equally represented in the sample. The participants were between 18 and 56 years of age, with the majority falling in the 18–24 age bracket (61.1%), followed by those aged 25–34 (16.7%). Given that younger people are more likely to be interested in using a mobile wallet (Mercator Advisory Group 2013), the sample composition was deemed appropriate for the study purposes (see Table 1(a)).

A FG was approximately of 40 minutes duration. The discussions were audio-recorded and transcribed verbatim. Prior to them, the participants completed a short questionnaire on their socio-demographic profile, smartphone ownership, and duration of smartphone use. Participants' PIIT was measured with four questions from Agarwal and Prasad (1998), using a 7-point Likert scale (from 1 = strongly disagree to 7 = strongly agree). The FG protocol was semi-structured with open-ended questions to allow for guided open discussion and opinion sharing. Two initial questions were about participants' awareness and knowledge of mobile wallets, followed by a definition of a mobile wallet along with pictures of an example of the application. The subsequent questions aimed at identifying key influences on the participants' BI to adopt a mobile wallet. Recurrent themes and patterns in the FGs' data were identified by means of thematic analysis (Attride-Stirling 2001; Braun and Clarke 2006). The data management and analysis were facilitated by the use of NVivo 12 software.

Table 1a. Demographic profile of focus groups' participants.

Demographic characteristics		Frequency	Percentage
Gender	Male	9	50
	Female	9	50
Age	18–24	11	61.1
	25–34	3	16.7
	35–44	0	0
	45–54	2	11.1
	55+	2	11.1
Income	N/A	8	44.4
	Below £15,000	1	5.6
	£15,000 – £24,999	4	22.2
	£25,000 – £34,999	3	16.7
	£35,000 – £49,999	1	5.6
	£50,000 – £79,999	1	5.6
	Above £80,000	0	0
Employment Status	Unemployed	0	0
	Part-time	2	11.1
	Full-time	8	44.45
	Student	8	44.45

Quantitative method

Survey procedure and sample

After the FGs, an online survey was conducted with 182 respondents, who resided in the United Kingdom. The size of the sample was impacted by both resources and statistical considerations. With path analysis used for the data analysis (instead of SEM with indicators and latent factors) and nine predictor variables in our model, our sample size compares favorably to the sample sizes determined by the following simple rules of thumb: (a) 15 subjects per predictor (Stevens 2002); (b) $N \geq 50 + 8$ m (m = number of predictors) for testing multiple correlations, and $N \geq 104 + m$ for testing individual predictors in regression solutions (Tabachnick and Fidell 2001). The questionnaire was completed on the Qualtrics online platform, a US-based research agency. No incentives were provided for the survey participation. Similar to the FGs, a combined convenience and snowball sampling strategy was used to recruit the survey participants. Since the aim of this part of the research was to test the study conceptual model rather than to generalize to the wider population, this sampling method was considered suitable for addressing the study objectives. The online survey link was distributed through email and social media channels.

The demographic profile of the survey participants is presented in Table 1(b). Similar to the FGs sample, the majority of the respondents were young people aged between 18–24 years (69.8%), followed by those aged 25 to 34 (11%). Given the afore-mentioned younger people's interest in using the mobile wallet apps, the sample composition of the survey was deemed appropriate for testing the study hypotheses. With regard to their awareness or prior experience with a mobile wallet, of the 182 participants the majority either had not heard (53.8%), or were unsure (3.3%) about the mobile wallet concept; the remaining 42.9% expressed familiarity with it. Also, most of the study participants (88.5%) reported not currently using a mobile wallet, while only 4.9% stated using such. A further 6.6% chose the answer option 'Unsure'.

Table 1b. Demographic profile of survey participants.

Demographic characteristics		Frequency	Percentage
Gender	Male	105	57.7
	Female	77	42.3
Age	18–24	127	69.8
	25–34	20	11
	35–44	11	6
	45–54	9	4.9
	55+	15	8.2
Income	N/A	47	25.8
	Below £15,000	48	26.4
	£15,000 – £24,999	35	19.2
	£25,000 – £34,999	25	13.7
	£35,000 – £49,999	17	9.3
	£50,000 – £79,999	4	2.2
	Above £80,000	6	3.3
Employment Status	Unemployed	7	3.8
	Part-time	18	9.9
	Full-time	87	47.8
	Student	70	38.5

Questionnaire development

Prior to the survey administration, the questionnaire was reviewed by a marketing expert and then completed by three participants for possible ambiguities and ease of comprehension. As a result, a few items were reworded. The final version of the questionnaire began with basic demographic questions. Then, information on participants' familiarity with and use of mobile wallets was collected. This information was not used to screen out study participants, but to gauge the overall level of awareness and possible experience with a mobile wallet. Next, the mobile wallet definition used in the FGs was presented. The ensuing questions captured the constructs of the study conceptual model. The constructs were measured with validated instruments from previous research, adapted to the context of mobile wallets.

ATT toward using a mobile wallet was measured with three items from Schierz, Schilke, and Wirtz (2010) (e.g. 'Overall I believe using a mobile wallet is a good idea'). PU was measured with one item from Davis (1989). Davis' PU scale captures different aspects of job performance, such as task completion and effectiveness; as mobile wallets are for individual use, we used the only item from this measure that was most pertinent to the individual use context of the mobile wallet app (i.e. 'I believe using a mobile wallet would be useful to me'). PRA consisted of three items from Karahanna et al. (2002) (e.g. 'I believe using a mobile wallet offers more benefits than using a traditional wallet or purse'). The measure of SI comprised three items from Venkatesh et al. (2003) (e.g. 'People whose opinion I value think I should use a mobile wallet in the foreseeable future'). PS and TR were measured using three items for each construct from Kim et al. (2010) (e.g. 'I believe mobile wallets are secure'; 'If I were to use a mobile wallet, I trust it would work exactly as described', respectively). Finally, PIIT was measured with the four items from Agarwal and Prasad (1998), used during the FGs (e.g. 'Among my peers, I am usually the first to try out new information technologies').

BI to adopt a mobile wallet was operationalized with one question, which asked if the participants believed they would use a mobile wallet in the foreseeable future. Given that BI is a concept, which is unambiguous to respondents, using a single-item measure was deemed appropriate. Empirical evidence also supports its use (see, for example, Bergkvist and Rossiter 2007). The operationalization of the study constructs is provided in Appendix A. The responses to these measures were captured on 7-point Likert scales, ranging from 1 (strongly disagree) to 7 (strongly agree).

Data analysis

Qualitative data analysis

The discussion below presents the findings of the study's FGs.

Attitude toward the mobile wallet concept

The study participants expressed mixed attitudes about the overall idea of the mobile wallet. Some participants held positive views, which were largely based on the PU of the mobile wallet (as discussed below). This notion is reflected in the following excerpt:

> "I think it's a good idea in principle … I think it'll be one of those things where it will end up happening." (Participant 1, female, aged 25–34)

The extent of liking of this innovation was also linked to security and availability concerns, as evidenced in the following two excerpts:

> "The idea is there, but there are still too many hurdles in terms of security and availability." (Participant 2, male, aged 25–34)

> "I like it, but security [is an issue] … I don't think I'd put debit or credit card on it … Security is the one big thing to me, I'd be willing to try all the features if I was sure it was safe." (Participant 12, male, aged 18–24)

There were also participants who were rather skeptical about the mobile wallet. The negative views were largely related to the above-mentioned security concerns and the risks associated with potential security breaches. The need to replace a currently owned (older model) mobile phone with a new one was also mentioned by one participant. The following two excerpts shed light on this notion:

> "Sounds far too risky to me at the moment, far too risky" (Participant 4, male, aged 55+)

> "I'd be quite anti as I'd have to use a phone and get a new one" (Participant 3, female, aged 55+).

Perceived usefulness of the mobile wallet

The FGs' participants identified several benefits of using a mobile wallet. Among them, convenience was mentioned as the most useful feature: the mobile wallet makes void the need to carry a wallet, as well as several loyalty cards, in addition to the mobile phone. Some participants mentioned other benefits, such as the ability to track spending on payment cards, or to receive personalized offers linked to these cards. The following excerpt demonstrates several of these issues:

> "It's not a case of speed is it, it's more convenience … If I've got 4 cards all on my phone then I just have to use the phone and can leave the cards at home … It's a good idea you could have all your passwords and everything on there if you had it all on one … [about transactions being recorded]. That would be good you could have all your banks on there and it would list all your transactions like a spreadsheet no doubt and tell you what your current balance is … I like the idea it would log everything down for you on each individual card and save you having to go home and write it down on your spreadsheet. If offers came up tailor made for me too then ok … Convenience of having everything on one phone providing you don't lose it." (Participant 4, male, aged 55+)

There were also skeptical views about the benefits from using a mobile wallet, expressed mainly by participants who did not have many payment and loyalty cards. Some participants also argued that cash will always be needed; hence, a traditional wallet will have to be carried in parallel to the mobile one. Concerns were also voiced with situations when the phone battery runs out. The following excerpts underscore these issues:

> "I don't have that many cards, I don't think I'd find it [the mobile wallet] useful … " (Participant 10, male, aged 18–24)

> "People will always need cash so you still need your wallet for that" (Participant 3, Female, aged 55+). "I do think you'd always still need your purse; it would take a really long time to feel comfortable … " (Participant 1, female, aged 25–34)

> "Mobile wallet needs a battery. What if you run out and can't charge it?" (Participant 2, male, aged 25–34)

With regard to the potential usefulness of the mobile wallet for 'carrying' one's identity documents (e.g. passport, driving license), this feature was mentioned mainly as a security risk. Besides, identity documents should still be carried in their original form. These issues are demonstrated by the following two excerpts:

> "It's [security] a major concern if you've got all your details on your phone and some blaggard whips your phone away they've got all your details … Surely if you had your passport crooks would be able to download and copy it … They've got to get the security right, because banks could jump on the bandwagon and say you mucked it up yourself we're not liable for your loss … It's solely down to security." (Participant 4, male, aged 55+).

> "I'd still have my wallet for id as no one would accept it from the phone." (Participant 2, male, aged 25–34)

Perceived relative advantage of the mobile wallet

During the discussions some advantages of the mobile wallet over the traditional one were identified, which were mainly related to the convenience factor discussed above: the participants frequently commented on that they would no longer need to carry a wallet or purse. Convenience was also noted in the context of having many loyalty cards, as illustrated in the following excerpt:

> "It comes down to if it was a loyalty card it would be easier, if you had ten it would be easier than flicking through your wallet looking for the right one … " (Participant 2, male, aged 25–34)

However, the relative advantage of the mobile wallet is likely to diminish if both the mobile and the traditional wallets have to be carried at the same time. This may well be the case for the next few years, until the technology becomes more widely accepted by both consumers and retailers. The following excerpts illustrate this notion:

> "There would always be situations where you have to have your wallet and it would take a while for you to feel comfortable not having your purse or cards with you." (Participant 1, female, aged 25–34)

> "I like it, depending on when it becomes more available … I'd use all of the features as long as I can widely use it and not in a selection of shops. But I do like the idea of it." (Participant 14, male, aged 25–34)

The perceived relative advantage of the mobile wallet is likely to diminish for those consumers, who value their purses/wallets beyond their functional features. Luxury purses and wallets are high status items, priced highly, hand-made using high quality materials, and aesthetically pleasing. Thus, they are designed to provide symbolic and hedonic value beyond their functionality. What is more, particularly for female consumers, purses are often coordinated with other pieces of the outfit, such as shoes and/or belts. This issue is captured in the following excerpt:

> "I reckon the thing with purses is that as a girl you go for something flashy or expensive so you can show it off – it's an accessory and isn't just there to be used. With an app you can't have a designer one." (Participant 4, male, aged 55+)

Social influence on mobile wallet adoption

Several participants commented that if people who matter to them use and/or recommend the mobile wallet, this would encourage them to adopt it. Given the risks associated with being an early adopter of a mobile wallet, as well as the uncertainties about the benefits from using this innovation, social referents were seen as a way to reduce risks and gain information about how the technology works. Apparently, the advice of important others is highly valued in the context of the mobile wallet adoption, as it gives reassurances and greater confidence in using the technology. The following excerpts illustrate these points:

> "Yeah you might want to be the first to try it but then that could have consequences with all the bugs and stuff, as it is an app so will have bugs. So you'd be the first one to experience those and you might pay for it literally. I reckon if somebody recommended it to I'd have to have them demonstrate it to me then I'd probably look it up myself until I decided to get it and it's safe." (Participant 5, female, aged 18–24)

> "I'd probably only start using it if people around me started using it – it just builds my confidence that it's safe and it actually does what you want." (Participant 10, male, aged 18–24)

Perceived security and mobile wallet adoption

PS was a highly debated topic and a major cause for concern among all participants. The main security issues mentioned were about the safety of personal and financial data. The security concerns were underpinned by the belief that digital technologies are vulnerable to hacking. These concerns compounded to the idea that using a mobile wallet could add to the severity of losing a phone – not only would an expensive piece of technology be lost, but potentially further financial and sensitive personal information losses could be incurred. High security concerns were often mentioned by the participants as a major deterrent for adopting the mobile wallet innovation. These issues are captured in the following excerpts:

> "It's [security] a major concern if you've got all your details on your phone and some blaggard whips your phone away they've got all your details … Surely if you had your passport crooks would be able to download and copy it … They've got to get the security right, because banks could jump on the bandwagon and say you mucked it up yourself we're not liable for your loss … It's solely down to security. Great idea and everything yes fine … the consumer, whose main worry is security." (Participant 4, male, aged 55+)

> "If you lose your phone you've lost your card details too. Normally if you lose your card they can't do anything, but if someone nicks your phone and they could hack the PIN, then they have access to all your bank accounts, and your passport, and your driving license and everything like that." (Participant 11, male, aged 18–24)

> "If the security is sorted out and I'm 100% confident it's secure then yeah definitely [I see myself using one in the foreseeable future]." (Participant 15, male, aged 18–24)

Consumer trust and mobile wallet adoption

Trust was identified by all participants as an important factor for adopting the mobile wallet. There was a general consensus that the mobile wallet provider must be a well-

known company, which is respected and trusted by the participants. The preference of the majority of the participants was for their bank or a provider authorized by their bank. The involvement of the banks was important to the participants in order to protect them from possible financial losses in the instances of debates over fraud due to the mobile wallet application. Evidence of these issues occurs in the following two excerpts:

> "At the end of the day it's coming out your bank account, so it's got to be your bank. If they aren't behind it then they're taking one step away from any issues and they'd still take money off you." (Participant 4, male, aged 55+)

> "I wouldn't mind who [provides the wallet] as long as the people who I bank with allow it and approve it … As long as they're respectable and I know them – I wouldn't want companies that I've never heard of before handling my bank accounts." (Participant 14, male, aged 25–34)

Personal innovativeness in information technology and mobile wallet adoption

The participants with the lower PIIT scores (i.e. PIIT below 3.5) expressed reluctance to adopt mobile wallets, mainly due to lack of knowledge of the mobile wallet technology and the benefits it could provide to users. Using the mobile wallet application also requires ownership of a smartphone, Internet access, and proficient use of a wider range of smartphone functions, which pose additional challenges to those who are not particularly interested or prepared (e.g. financially, technologically) to adopt the innovation. For this consumer group, the costs of using a mobile wallet (e.g. time needed to acquire knowledge and develop skills, financial and psychological burdens) may well outweigh any perceived benefits. The following quotes reflect on these issues:

> "I don't think they [mobile wallets] are for people who don't use their phone and aren't tech savvy … Only that you don't have to carry your purse around as well as a phone … I think it would be something I'd go into very slowly and I'd be quite anti as I'd have to use a phone and get a new one." (Participant 3, female, aged 55+, PIIT 2.25).

> "It's unlikely for me [to use a mobile wallet in the future], but I guess if it does just become the norm then it'll end up happening someday." (Participant 17, female, aged 18–24, PIIT 2.5)

In contrast, higher PIIT scorers (PIIT above 4.5) perceived a number of benefits and advantages of the mobile wallet beyond those of the traditional wallet. The excerpts quoted above to illustrate the positive views on PU and PRA come from participants who belong to this group. Apparently, their innovative nature might have enabled them to better understand the advantages of using mobile wallets in both absolute (PU) and relative (PRA) terms. However, their views were more varied as to their willingness to adopt the mobile wallet innovation. For example, one participant was rather unlikely to adopt the mobile wallet, another one was unlikely to be among the early adopters, yet others responded affirmatively as to their intention to use a mobile wallet in the foreseeable future. These diverse opinions are captured in the following excerpts:

> "We'll get more paranoid as we get older too – probably not" (Participant 10, male, aged 18–24, PIIT 4.75)

"I wouldn't be one of the first to use it – I'd give it a couple of months to see how it goes." (Participant 7, female, aged 18–24, PIIT 4.75).

"I think I do [foresee myself using a mobile wallet in the future], if it all goes to plan and it can do everything it says it can then yeah why wouldn't I use it" (Participant 16, male, aged 18–24, PIIT score 5).

Survey data analysis

Reliability and validity

The psychometric properties of the composite measures were assessed using Cronbach's alpha and Principal Component Analysis (PCA). CFA was not conducted due to the large number of latent factors and indicators relative to the sample size. To check for common method bias, we used Harman's single factor test, which is commonly used by researchers (Tehseen, Ramayah, and Sajilan 2017). Specifically, we run PCA with the number of factors constrained to 1 and no rotation. The only factor that emerged explained 39.27% of the variance in the data. Since this figure is below 50%, we can conclude that the variations in the responses were caused by the actual predispositions of the respondents captured with the measurement instrument rather than by the instrument. All Cronbach's alphas are well above 0.70: ATT (0.92), PRA (0.88), SI (0.93), PS (0.88), TR (0.85), and PIIT (0.88). Thus, the measures are internally consistent. PCA with Varimax rotation was run as part of the convergent and discriminant validity checks. All items loaded on the expected factors. However, one trust item loaded higher on PS and was excluded from further analysis. Cronbach's alpha of the trust measure declined slightly (from 0.85 to 0.83). All factor loadings are above 0.7 (see Table 2). In addition, all Average Variance Extracted (AVE) estimates were above 0.5: ATT (0.57), PRA (0.66), SI (0.81), PS (0.72), TR (0.64), and PIIT (0.71). Hence, evidence for adequate convergent validity was found (Hair et al. 2006).

Additionally, all AVE statistics were greater than the squares of the respective correlations (see Table 2). Hence, support for adequate discriminant validity was also found (Hair et al. 2006).

Survey results

The hypotheses were tested by applying path analysis with Amos 22. The effects of the independent variables and their significance were assessed with 10,000 bootstrap samples with bias-corrected confidence intervals set at 95%. Bootstrap estimation was used because of its advantages when working with relatively small samples. In the model in Figure 1, two pairs of logical correlations were also estimated: PU–PRA (0.63), and PS–Trust (0.58). The model fit statistics indicate that the tested model provided a generally good fit to the data, particularly in terms of GFI and CFI, both having values greater than 0.9: CMIN/DF = 6.189, GFI = 0.929, CFI = 0.921, and RMSEA = 0.169. With regard to RMSEA, which was slightly above 0.1 (recommended values below 0.1, see Hair et al. 2006), it has been argued that this statistic might be a biased indicator of model fit for samples below 200 (Curran et al. 2003). As this is the case of our study, RMSEA value should be treated with some caution. Table 4 includes the standardized regression coefficients of the Structural Equation Modeling (SEM) estimates. The independent variables explained 60% of the variance in BI to adopt a mobile wallet.

Table 2. Principal component analysis of composite measures with Varimax rotation.

	Component					
Construct	1	2	3	4	5	6
PIIT1	**.875**	−.022	.088	−.011	.166	.021
PIIT2	**.863**	.018	.153	−.025	.125	.126
PIIT3	**.839**	.112	.234	−.002	−.113	.125
PIIT4	**.789**	−.078	−.019	.024	.006	−.043
SI1	−.009	**.910**	.145	.037	.194	.086
SI2	.000	**.899**	.158	.126	.166	.132
SI3	−.002	**.895**	.158	.110	.123	.096
PRA1	.136	.209	**.844**	.188	.166	.134
PRA2	.165	.177	**.831**	.137	.290	.045
PRA3	.168	.126	**.751**	.005	.334	.163
PS1	−.063	.107	.050	**.866**	.063	.018
PS2	.025	.063	.130	**.843**	.178	.301
PS3	.026	.098	.153	**.840**	.240	.313
ATT1	.079	.214	.394	.163	**.778**	.179
ATT2	.065	.261	.269	.306	**.748**	.232
ATT3	.093	.252	.399	.190	**.739**	.190
TR1	.051	.166	.237	.242	.234	**.812**
TR2	.155	.164	.078	.348	.195	**.792**

In order to test the anticipated effects, two different models were estimated: one in which the path from ATT to BI in Figure 1 was deleted to remove the influence of this intermediate variable (see Panel A results in Table 3), and another model which included all paths in Figure 1 (see Panel B results in Table 4). The full model in Figure 1 is called 'Model 1', and the model with the deleted ATT – BI path is labeled 'Model 2'. The Panel B results are also visually presented in Figure 2. We also examined if consumers' demographics in terms of gender and age – two common control variables – had any confounding effects on the relationships in Model 1. For this purpose, we re-estimated Model 1 with these two additional variables added to it. The links of gender and age with all endogenous variables (i.e. PU, PRA, and AT) and the dependent variable (BI) were estimated.

H1 posits that ATT toward using a mobile wallet has a positive effect on BI. This hypothesis was supported ($\beta = 0.506$, $p < 0.001$). Hypothesis H2a, stipulating that PU has a positive effect on ATT toward using a mobile wallet, was also supported ($\beta = 0.232$, $p < 0.001$). According to H2b, PU positively influences BI. Model 2 was estimated for the test of this hypothesis. Consistent with H2b, higher PU led to stronger BI: $\beta = 0.244$, $p < 0.001$ (see Table 4, Panel A). Thus, H2b was also supported.

H3a, according to which PRA has a positive effect on ATT toward using a mobile wallet, was also supported ($\beta = 0.404$, $p < 0.001$). H3b anticipates a positive effect of PRA on BI. To

Table 3. Discriminant validity.

Construct	1	2	3	4	5	6
(1) Attitude (ATT)	**0.570**					
(2) Social influence (SI)	0.245	**0.812**				
(3) Perceived security (PS)	0.231	0.069	**0.722**			
(4) Trust (TR)	0.366	0.152	0.504	**0.643**		
(5) Perceived relative advantage (PRA)	0.487	0.166	0.104	0.191	**0.656**	
(6) Perceived innovativeness in IT (PIIT)	0.039	0.002	0.001	0.033	0.102	**0.709**

Note: AVE statistics are in the diagonal. Shared variance statistics are in the remaining cells.

Table 4. Bootstrap estimates of the effects of ATT, PU, PRA, SI, PS, TR, and PIIT on BI to adopt a mobile wallet (Beta coefficients and significance).

Estimated Path			*Beta*	*p*	*Hypotheses' support*
PANEL A. Path from Attitude to BI deleted					
Perceived usefulness (PU)	→	Attitude (ATT)	0.232	< 0.001	Yes
Perceived usefulness (PU)	→	BI to adopt a mobile wallet	0.244	< 0.001	Yes
Perceived relative advantage (PRA)	→	Attitude (ATT)	0.404	< 0.001	Yes
Perceived relative advantage (PRA)	→	BI to adopt a mobile wallet	0.318	< 0.001	Yes
Social influence (SI)	→	BI to adopt a mobile wallet	0.260	< 0.001	Yes
Social influence (SI)	→	Perceived usefulness (PU)	0.350	< 0.001	Yes
Social influence (SI)	→	Perceived relative advantage (PRA)	0.395	< 0.001	Yes
Social influence (SI)	→	Attitude (ATT)	0.182	< 0.001	Yes
Perceived security (PS)	→	Attitude (ATT)	0.163	< 0.01	Yes
Perceived security (PS)	→	BI to adopt a mobile wallet	0.144	< 0.05	Yes
Trust (TR)	→	Attitude (ATT)	0.203	< 0.001	Yes
Trust (TR)	→	BI to adopt a mobile wallet	0.118	0.07	No
Perceived innovativeness in IT (PIIT)	→	Perceived usefulness (PU)	0.299	< 0.001	Yes
Perceived innovativeness in IT (PIIT)	→	Perceived relative advantage (PRA)	0.304	< 0.001	Yes
Perceived innovativeness in IT (PIIT)	→	BI to adopt a mobile wallet	−0.015	0.79	No
PANEL B. Antecedent and Mediator Paths to BI					
Attitude (ATT)	→	BI to adopt a mobile wallet	0.506	< 0.001	Yes
Perceived usefulness (PU)	→	Attitude (ATT)	0.232	< 0.001	Yes
Perceived usefulness (PU)	→	BI to adopt a mobile wallet	0.122	0.064	No direct effect Indirect effect via ATT
Perceived relative advantage (PRA)	→	Attitude (ATT)	0.404	< 0.001	Yes
Perceived relative advantage (PRA)	→	BI to adopt a mobile wallet	0.108	0.13	No direct effect Indirect effect via ATT
Social influence (SI)	→	BI to adopt a mobile wallet	0.171	< 0.01	Yes Yes (direct and indirect effects via PU, PRA & ATT)
Social influence (SI)	→	Perceived usefulness (PU)	0.350	< 0.001	Yes
Social influence (SI)	→	Perceived relative advantage (PRA)	0.395	< 0.001	Yes
Social influence (SI)	→	Attitude (ATT)	0.182	< 0.001	Yes
Perceived security (PS)	→	Attitude (ATT)	0.163	< 0.01	Yes
Perceived security (PS)	→	BI to adopt a mobile wallet	0.065	0.27	No direct effect Indirect effect via ATT
Trust (TR)	→	Attitude (ATT)	0.203	< 0.001	Yes
Trust (TR)	→	BI to adopt a mobile wallet	0.011	0.85	No direct effect Indirect effect via ATT
Perceived innovativeness in IT (PIIT)	→	Perceived usefulness (PU)	0.299	< 0.001	Yes
Perceived innovativeness in IT (PIIT)	→	Perceived relative advantage (PRA)	0.304	< 0.001	Yes
Perceived innovativeness in IT (PIIT)	→	BI to adopt a mobile wallet	0.009	0.86	No direct effect Indirect effect via PU, PRA & ATT

test this hypothesis, Model 2 estimates were again used for the same reason (see Table 4, Panel A). This hypothesis was also supported ($\beta = 0.318$, $p < 0.001$).

H4 stipulates that SI has positive effects on (a) BI, (b) PU, (c) PRA, and (d) ATT. Indeed, all four hypothesized effects were significant and in the expected direction (see Table 4, Panel B): SI on BI ($\beta = 0.171$, $p < 0.01$); SI on PU ($\beta = 0.350$, $p < 0.001$); SI on PRA ($\beta = 0.395$,

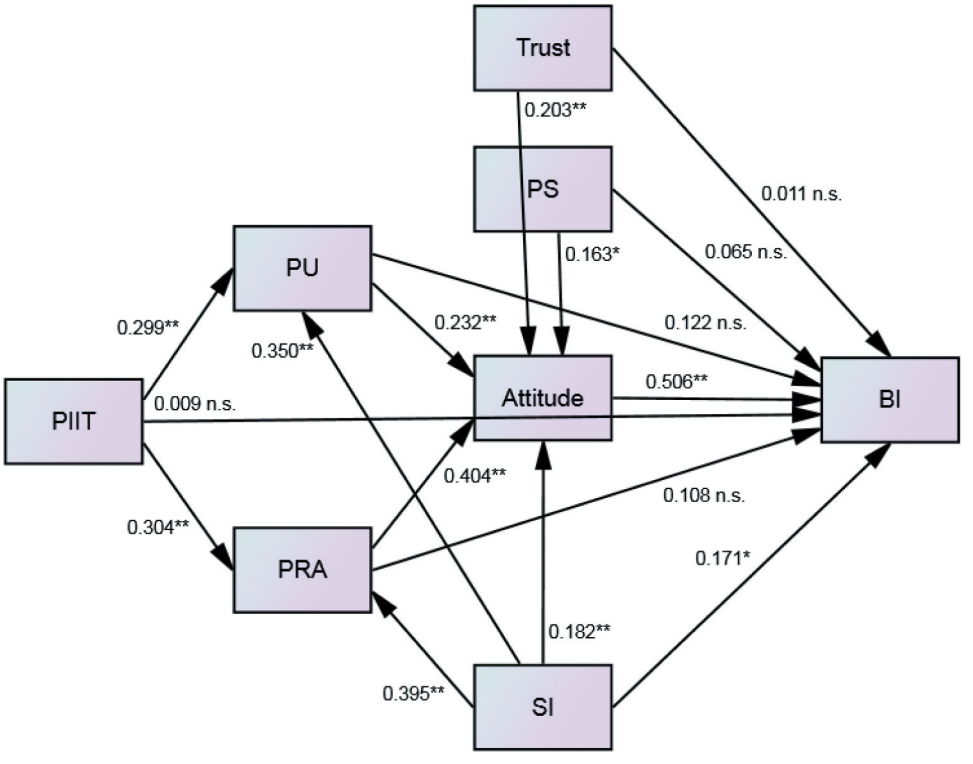

Figure 2. Results from the testing of the conceptual model of behavioral intention to adopt a mobile wallet. Note: n.s. ≥ 0.05; *p ≤ 0.01; **p ≤ 0.001

$p < 0.001$); and SI on ATT (β = 0.182, $p < 0.001$). The effect of SI on BI became stronger when the path from ATT to BI was removed (β = 0.260, $p < .001$) (see Table 4, Panel A).

Consistent with H5a, PS had a positive effect on ATT (β = 0.163, $p < 0.01$). To test the hypothesized positive effect of PS on BI (H5b), Model 2 estimates were used (see Table 4, Panel A). As expected, higher PS led to stronger BI (β = 0.144, $p < 0.05$). In line with H5c, TR significantly positively influenced ATT (β = 0.203, $p < 0.001$). However, H5d stipulating a positive effect of TR on BI was not supported by the estimates of Model 2, used for the above-mentioned reason (β = 0.118, $p = 0.07$).

H6 posits that PIIT has positive effects on (a) PU, (b) PRA, and (c) BI. Consistent with the first two propositions, PIIT had significant positive effects on PU (β = 0.299, $p < 0.001$) and PRA (β = 0.304, $p < 0.001$). To test H6c, Model 2 estimates were used (see Table 4, Panel A). At variance with expectation, the effect of PIIT on BI was not significant (β = −0.015, $p = 0.79$).

To test H7, in the full model (Model 1) the indirect effects via ATT of five predictors of BI were estimated. All tested indirect effects on BI were significant: PU $I_{unstand.} = 0.117$, $p < 0.01$; PRA $I_{unstand.} = 0.260$, $p < 0.001$; SI $I_{unstand.} = 0.364$, $p < 0.001$; PS $I_{unstand.} = 0.104$, $p < 0.01$; and TR $I_{unstand.} = 0.111$, $p < 0.01$. Full mediation was found for PU, PRA, PS, and TR on BI, whereas only partial mediation for SI. Therefore, H7 was fully supported.

Regarding H8, as part of the estimation of Model 1, support for the mediation PU and PRA on the relationships of SI (H8a/c) and PIIT (H8b/c) with ATT was $I_{unstand.} = 0.204$, $p < 0.001$; and PIIT $I_{unstand.} = 0.152$, $p < 0.001$. To separate the effects of PU and PRA, the 'user-defined estimands' function of Amos was used, specific indirect effects and their significance to be estimated. The results additional analysis confirmed the hypothesized individual mediation effects PRA: SI–PU $I_{unstand.} = 0.069$, $p < 0.01$, SI–PRA $I_{unstand.} = 0.135$, $p < 0.001$; PIIT– $= 0.055$, $p < 0.01$, and PIIT–PRA $I_{unstand.} = 0.097$, $p < 0.001$. Therefore, H8 (a,b supported.

Further, H8 (a,b/d) was tested by applying again the 'user-defined estimand of Amos. The tested mediation effects of PU and PRA on BI were not signific $I_{unstand.} = 0.052$, $p = 0.084$, SI–PRA $I_{unstand.} = 0.052$, $p = 0.110$; PIIT–PU I_{unstan} $p = 0.080$, PIIT–PRA $I_{unstand.} = 0.037$, $p = 0.097$. Therefore, H8 (a,b/d) is not supp results from this test are consistent with the reported above findings that ATT fully the effects on PU and PIIT on BI. In view of these findings and the signifi effect of SI on BI (H4a), its effect on BI is only partially mediated by PU, PRA ar the path through PU $I_{unstand.} = 0.050$, $p < 0.01$, and through PRA $I_{unstand.} = 0.098$ The mediation findings for PIIT and the non-significant effect of PIIT on BI (H6 full mediation by PU, PRA and ATT: for the path through PU $I_{unstand.} = 0.040$, $p <$ through PRA $I_{unstand.} = 0.071$, $p < 0.001$.

Our re-estimation of Model 1 with gender and age included revealed non- effects of both demographic variables on the three endogenous variables, as we $\beta = -0.061$, $p = 0.20$; and $\beta = 0.054$, $p = 0.25$, respectively. Thus, gender and a confound the relationships specified in Model 1.

Discussion of results

The present study identified a number of key antecedent and mediator fa examined their effects on BI to adopt a mobile wallet. The developed model a high percentage of variance in BI. What is more, all but three hypoth confirmed. A discussion of the study findings follows below.

With regard to the hypothesized effect of ATT on BI, consistent with the TF role of ATT in explaining BI (Ajzen and Fishbein, 1977), as well as with existing (Schierz, Schilke, and Wirtz 2010), ATT had a significant positive influence on B a mobile wallet. What is more, ATT was a powerful mediator of the effects of P TR, and PIIT on BI, as well as the strongest predictor of BI. These findings unde key role of attitudes for the mobile wallet adoption.

Next, our findings from both data sources confirmed the important role shaping ATT toward using a mobile wallet. This finding is consistent with

With regard to PRA, the qualitative fieldwork not only underscored the important role of PRA in the context of mobile wallet adoption, but also drew attention to two situations that can lead to weakened PRA effect: (a) when there is a need to carry both the mobile and the traditional wallets at the same time; and (b) when the traditional wallet/purse is used as a fashion accessory. In line with the Diffusion of Innovations theory and empirical evidence (e.g. Teo and Pok 2003; Hameed, Counsell, and Swift 2012), PRA had significant positive effects on ATT and BI. However, when accounting for the mediating role of ATT, PRA influenced BI only indirectly, which indicates full mediation by ATT.

As to the role of SI in the mobile wallet adoption process, empirical support was found in our qualitative and survey data. The significant positive effect of SI on BI is in line with UTAUT theory and empirical evidence (Yang et al. 2012). Our finding that SI is the second strongest predictor of BI after ATT indicates its potency for explaining mobile wallets' adoption. Consistent with the susceptibility to interpersonal influence notion and previous research (Yang et al. 2012), SI positively influenced PU, PRA, and ATT. In line with prior expectation, the latter mediated the effect of SI on BI, although only partially.

With regard to PS, both our FGs' and survey data clearly indicated the important implications of the safety of personal and financial data for the liking of and intention to adopt a mobile wallet. Consistent with our argumentation and existing evidence (Liébana-Cabanillas, Sánchez-Fernández, and Muñoz-Leiva 2014), our study found that the more secure the use of a mobile wallet is viewed to be, the more positive is the attitude toward using it. Also as expected, the positive effect of PS on BI was significant. However, it became trivial when accounting for the mediating role of attitude.

Our study also confirmed that trust in the secure and reliable use of the mobile wallet, as well as in the reliability of the mobile wallet providers, leads to positive attitudes toward using this innovation. The qualitative data clearly showed that consumers trusted well-known companies, particularly their banks. Trust did not show a direct effect on BI, which was counter to prior expectation. However, consistent with the attitude mediation hypothesis, the effect of trust on BI was mediated (fully) by attitude. Thus, trust may have enough of an impact to shape attitudes, but it may not be enough to influence directly BI in the context of mobile wallet adoption. This finding is in line with Grazioli and Jarvenpaa (2000) and Wu and Chen (2005).

Regarding PIIT, consistent with Rogers (2003) argument about the influence of an individual's innovativeness on the innovations' adoption process, as well as empirical evidence (Leong et al. 2013; Yang et al. 2012), the positive effects of PIIT on PU and PRA were confirmed. However, at odds with prior expectation and the findings of Crespo and Rodriguez (2008) and Lu et al. (2008), no direct effect of PIIT on BI was found. The mediation analysis confirmed a significant indirect effect of PIIT on BI via PU, PRA and ATT. Therefore, consumer innovativeness does not affect directly BI in the context of mobile wallet adoption.

Managerial implications and directions for future research

The important role that attitudes play as both an intermediate antecedent to BI and mediator of all other studied relationships indicates that companies who are involved in

the development and application of the mobile wallet need to engage in informative marketing campaigns, which make explicit the most important benefits of the mobile wallet, as a whole and relative to the traditional one. A key benefit identified by the present research is convenience, i.e. having everything in one place and thus not needing to carry several cards, receipts, and store coupons, as well as receiving and responding to offers before others. Therefore, convenience should be emphasized as the core value proposition of this innovation, at least at this initial stage of its adoption. The prevailing security concerns clearly indicate that the key to consumers' more positive attitudes and ultimately adoption is how mobile wallet's service providers tackle this issue to alleviate any such fears. Hence, marketers need to inform consumers as to how the secure use of the mobile wallet is achieved, who is behind the mobile wallet provision, and who is liable in case of any issues arising. Specific features should be included to address security concerns (e.g. fear of fraud and identity theft), such as encrypted payment and personal information, and users' ability to control when and where the mobile wallet can be used. The study qualitative findings clearly indicate that an emphasis on an established reputable corporate brand could build initial trust, which is particularly important until individual end users gain more experience with the mobile wallet application. Banks' involvement in the provision of mobile wallet services will provide assurances about the mobile wallet secure use, as well as reduce perceived financial risks in case security breaches occur. This is a huge opportunity for the banks to extend their payment services and competitive edge, especially in the face of growing competition from high tech and other firms who have entered into the digital payment territory. Mobile wallet providers can use security as a point of differentiation (by providing innovative solutions) to appeal to security-cautious consumers. After general awareness is built, mobile wallet providers may start talking also about secondary benefits, such as receiving market offers and the ability to track personal spending.

The study findings regarding SI could also be successfully leveraged by marketers. Apparently, the advice of people who matter to us is important on topics, such as why the mobile wallet is useful and the advantages it offers. Hence, individuals could be encouraged or even incentivized to share this application with important others. As individual end users are more trust-worthy sources of information than commercial ones, their impact is likely to be greater.

Our findings also suggest that in the early stages of technology adoption marketers should try to identify and target first the innovators, as they are likely to be better informed about the benefits and relative advantages of using a mobile wallet, to hold more positive attitudes toward its use, and thus to begin the spread of the innovation. The innovative consumers can be an excellent source of a positive word-of-mouth (WOM), which, when shared with important others in person or in the virtual space (Parry, Kawakami, and Kishiya 2012), is likely to influence their attitudes toward this innovation and consequently their intention to adopt it. Online social media platforms can be effectively used to create buzz around the mobile wallet application with engaging viral campaigns, which could potentially result in voluntary spreading of the marketing message across millions of social media users.

Study limitations and future research

Certain limitations of this research should also be mentioned. First, the study utilizes a cross-sectional design; a longitudinal approach could be very beneficial for studying technology adoption and continued usage (e.g. Sun and Jeyaraj 2013). Related to this, our study is focused on consumers' intention to adopt a mobile wallet. With an increasing acceptance of the mobile wallet technology, it would be worth exploring how the effects of the studied determinants change over time with the changes in users' experience with the mobile wallet. Second, while the sampling approach of this study survey was appropriate for testing the predictive validity of the proposed conceptual model and for gaining useful insights in the studied phenomena, future research on mobile wallet adoption could consider using a more nationally representative sample. Last but not least, future research could also focus on the role of retailers (i.e. the integration of the mobile wallet technology in their outlets), and the service providers' reputation for the adoption of the mobile wallet. Uncovering points of convergence as well as divergence between retailers and consumers on the mobile wallet's adoption will be beneficial for addressing any existing misconceptions, and thus for speeding up the diffusion of this innovation.

Conclusions

Through a mixed-method design, the present study identified a number of key antecedent and mediator factors and examined their effects on behavioral intention to adopt a mobile wallet. The study was conducted in the UK – a country with rather slow adoption of the mobile wallet innovation. Strong support was found for the viability of the study conceptual model. Attitude emerged as the strongest predictor of behavioral intention, followed by social influence. Our mediation tests helped to ascertain the mechanisms underlying the influences of the model's exogenous variables, namely, perceived innovativeness in IT, social influence, perceived security and trust, on adoption intention. Attitude emerged as a very important mediator of the studied relationships. In addition to advancing existing knowledge on the studied topic, our findings also provide valuable insights to different stakeholders across the mobile wallet value chain as well as suggestions for future research.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix A. Constructs' measurement

Construct	Item	Questions
Attitude (ATT)	ATT1 ATT2 ATT3	• Overall I believe using a mobile wallet is a good idea • Overall I believe using a mobile wallet would be wise • Overall I believe using a mobile wallet would be beneficial Schierz, Schilke, and Wirtz (2010)
Perceived Usefulness (PU)	PU	• I believe using a mobile wallet would be useful to me Davis (1989)
Perceived Relative Advantage (PRA)	PRA1 PRA2 PRA3	• I believe I would be more satisfied if I used a mobile wallet rather than if I used a traditional wallet or purse • I believe using a mobile wallet would be more beneficial to me than using a traditional wallet or purse • I believe using a mobile wallet offers more benefits than using a traditional wallet or purse Karahanna et al. (2002)
Social Influence (SI)	SI1 SI2 SI3	• People who are important to me will think that I should use a mobile wallet in the foreseeable future • People whose opinion I value will think I should use a mobile wallet in the foreseeable future • People who influence my behavior will think I should use a mobile wallet in the foreseeable future Venkatesh et al. (2003)
Perceived Security (PS)	PS1 PS2 PS3	• I do not fear security issues with a mobile wallet • I believe mobile wallets are secure • I believe if I stored information on a mobile wallet it would be secure Kim et al. (2010)
Trust (TR)	TR1 TR2 TR3	• If I were to use a mobile wallet, I trust it would work exactly as described • If I were to use a mobile wallet, I would trust using it at all retailers who accept this technology • I trust using a mobile wallet would be secure (deleted due to cross-loading with PS) Kim et al. (2010)
Personal Innovativeness in IT (PIIT)	PIIT1 PIIT2 PIIT3 PIIT4	• I like to experiment with new information technologies • Among my peers, I am usually the first to try out new information technologies • If I heard about a new information technology, I would look for new ways to experiment with it • In general, I am hesitant to try out new information technologies (reverse-coded) Agarwal and Prasad (1998)
Intention to Adopt a Mobile Wallet (BI)	BI	• I believe in the foreseeable future I will use a mobile wallet"