

HOW PRIVACY AFFECTS THE ACCEPTANCE OF MOBILE PAYMENT SOLUTIONS

Research paper

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Abstract

The rising need of mobility and convenience in payment processes has even forced traditional banking institutions to establish mobile payment (MP) applications in Germany. However, the breakthrough of this promising technology has not yet been realized. This raises the question about the negative effects of barriers, such as the companies' storage and usage of personal data resulting in consumers' privacy concerns. As research on MP calls for the integration of new models, this study aims to be the first to establish an APCO-model for the field of MP, thereby filling an essential research gap. Consequently, our model empirically validates privacy concerns and investigates its antecedents and predictive power to explain the intention to use MP systems. We additionally examined the barely studied effects of privacy concerns on risks as well as benefits. To give target-oriented recommendations, we included the theory of the diffusion of innovation and the factor "gadget loving" in our model. The results of our investigation underline the vital role of privacy concerns in the acceptance of MP and imply recommendations for the design of further research as well as an appropriate marketing communication of MP solutions.

Keywords: Mobile payment diffusion, Technological adoption, Privacy concerns, APCO-Model.

1 Introduction

In order to compete with the launch of Google Pay in Germany, traditional banks have started to establish their own solutions for paying with a smart device at the stationary point of sale (Treib, 2018), the so-called proximity mobile payment (MP) (Slade et al., 2015). This promising information system (IS) does not only offer a convenient and secure payment technology to the customer, but also an easy way for marketers to collect and analyze personal data regarding the consumer's buying behavior. While tailoring of digital services has proven to be beneficial to consumers, concerns regarding information privacy decrease the likelihood of using such personalized services (e.g. Chellappa and Sin, 2005; White, 2004). Research brings to light that individuals are concerned about their privacy and cautious regarding the collection and use of their personal information (Dinev et al., 2015; Grossklags and Acquisti, 2007; Truste, 2014). Reflecting on the increasing need of mobility and the facilitation of the payment process, practitioners and researchers have been highly interested in the factors that drive and dampen the adoption of MP. Herein, most research focused on established acceptance models, such as the Technology Acceptance Model (TAM) by Davis (1989), the Diffusion of Innovation (DOI) postulated by Rogers (2003) and the Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al. (2003). Consequently, both technological and social factors were identified to predict the acceptance of MP systems (Dahlberg and Öörni, 2007; Liébana-Cabanillas et al., 2014a; Zhou, 2014). However, merely a few studies considered barriers such as privacy concerns or uncertainty avoidance (Dahlberg et al., 2015).

To widen the scope of current research, we differentiated our study from previous investigations. Therein, we addressed the call for research of Dahlberg et al. (2015, p. 274) to use “other theories from other disciplines than those already applied in IS research – especially in TAM and UTAUT” as well as the call for research of Dinev, McConnell and Smith (2015) to put more effort into a comprehensive understanding regarding privacy-related decisions. Keeping that in mind, our study aims to be the first to develop a research model based on the enhanced APCO-model (Dinev et al., 2015), to investigate the influencing factors of the behavioral intention to use MP solutions. In contrast to other studies on MP, we established “privacy concerns” as a second-order construct, which results in a deeper understanding of privacy concerns as well as a good model fit. Additionally, we integrated the variable “gadget loving” as an antecedent of privacy concerns as well as of intention to use MP. Understanding gadget lovers as innovative and opinion-leading consumers (Bruner and Kumar, 2007) is of vital importance and helps to provide operators of MP platforms with target-oriented recommendations. To validate our research model, we collected data from 380 respondents and used structural equation modeling with SPSS AMOS 25 statistical software (Arbuckle, 2017).

The remainder of this paper is structured as follows: In the next section, we review the current literature concerning the acceptance of MP, privacy research and theory referring to the diffusion of innovations and the variable “gadget loving”. Subsequently, we explain the theoretical background of our research model and extrapolate our hypotheses. The succeeding two sections address the research methodology and the presentation of our results. Finally, we discuss our research findings, derive theoretical and practical implications, outline limitations and illustrate approaches for further research.

2 Relevant Work

2.1 Acceptance of mobile payment

The acceptance of MP from the consumer's perspective is an established and relevant field of research. Various theories have been proposed as a basis to explain the intention to use MP services, namely the TAM (Davis, 1989), the DOI (Rogers, 2003), and the UTAUT (Venkatesh et al., 2003) (Dahlberg et al., 2008; Dahlberg et al., 2015). These models were modified and enhanced for the context of MP through technological, psychological, social and demographic factors. Researchers argue that besides the technological aspects such as ease of use, usefulness and compatibility, trust (Arvidsson, 2014; Dahlberg et al., 2003), risk (e.g. Bernet, 2014), and security (e.g. Pousttchi, 2005) are essential predictors to explain the consumer's intention to use MP. There has also been research regarding the influence of

privacy concerns (e.g. Johnson et al., 2017; Slade et al., 2015) as a predictor of the intention to use MP. With regard to personal demographics, merely a few studies addressed group differences, herein mainly focusing on the factors gender (Liébana-Cabanillas et al., 2014a), age (Dahlberg and Öörni, 2007; Fischer et al., 2017; Liébana-Cabanillas et al., 2014b) and culture (Alshare and Mousa, 2014). An interesting study was conducted by Yang et al. (2012), who compared potential users of MP against a current usership. They identified stronger effects of “relative advantage” and “perceived risk” among the current users, indicating that current users show a more realistic perception regarding risks and benefits of MP systems compared to potential users (Yang et al., 2012). However, leading researchers in the field of MP claim that the named acceptance factors have been comprehensively investigated and only provide a few new insights (Dahlberg et al., 2008; Dahlberg et al., 2015) strongly encourage further consumer research to apply new theories in the field of MP as previous work has been limited to traditional acceptance models. As privacy concerns have only been scarcely addressed by previous research, this study aims to develop a research model in which this essential barrier is established in an appropriate manner according to previous findings in privacy research.

2.2 Information privacy research

Dinev and Hart (2006) stated that privacy “is a highly cherished value, few would argue that absolute privacy is unattainable” (Dinev and Hart, 2006, p. 61). As this study investigates the acceptance of MP as an IS technology, it focuses on the dimension of information privacy and refers to information that is individually identifiable or describes the private informational spheres of an individual (Smith et al., 2011). Within the scope of IS, such as MP, personal information is gathered through the analysis of personal data. Thus, this article treats personal information and personal data as equal, which is consistent with other privacy-related studies (Bélanger and Crossler, 2011; Malhotra et al., 2004). Privacy concerns are regarded as a central construct of empirical privacy research (Chen and Chen, 2015; Gana and Koce, 2016; Kokolakis, 2017; Steijn and Vedder, 2015). Since privacy itself is based on knowledge, perceptions and experiences and cannot be rationally captured (Smith et al., 2011), it is not possible to measure this construct. Therefore, privacy concerns have been seen as a proxy for measuring privacy and as a central research object in IS research (Li, 2011; Smith et al., 2011). Depending on the respective context, different measurement constructs for privacy concerns have been established over the past decades, e.g. the “Concern for Information Privacy” (CFIP) (Smith et al., 1996; Stewart and Segars, 2002), the “Internet Users' Information Privacy Concerns” (IUIPC) (Malhotra et al., 2004), and the “Mobile Users' Information Privacy Concerns” (MUIPC) (Xu et al., 2012). As privacy concerns emerged as the central measurement, the three most important macro-models in privacy research set the construct as the central explanation of privacy behavior (Bélanger and Crossler, 2011; Li, 2011; Smith et al., 2011). Whilst Bélanger and Crossler (2011) focused on the different group levels of privacy, Li (2011) and Smith, Dinev and Xu (2011) conducted macro-models with individual privacy concerns as their central aspect. Due to the omnipresence of privacy, different perspectives and definitions of privacy concerns have been developed in the scientific discourse. In summary, they can be defined as the concerns users have about a future loss of privacy as a result of the voluntary or involuntary disclosure of personal data (Dinev and Hart, 2006). This approach is followed by a broader definition of privacy, which defines privacy as the users' subjective view of fairness in dealing with personal data (Malhotra et al., 2004).

This essential part of the definition of privacy concerns and the inherent value of privacy is taken up in the construct of the privacy calculus. Data generated through consumers' use of IS is of particular value as it does not only offer insights to consumers' digital lives but also into their real lives. The privacy calculus is determined by a privacy trade-off between risks and benefits (Laufer and Wolfe, 1977) and suggests that individuals deliberate on the risk involved and the potential benefits received when they are asked to reveal personal information to others (Chellappa and Sin, 2005; Dinev and Hart, 2006). In privacy research, Dinev et al. (2015) call for the extension of the research perspective of privacy decisions and the integration of findings and constructs from other disciplines.

2.3 Diffusion of innovation

According to Rogers and Shoemaker (1971, p. 27), innovativeness is defined as “the degree to which an individual is relatively earlier in adopting an innovation than other members of his system.” With a more detailed scope on technology, Bruner and Kumar (2007, p. 330) define technological innovativeness as “the degree to which a person is earlier in adopting new technological products compared to others who adopt within some social system”. The concept of innovativeness is correlated to other personal research concepts, such as “novelty seeking”, which is “the desire of the individual to seek out novel stimuli” (Hirschman, 1980, p. 284) or “opinion leadership” (Ruvio and Shoham, 2007; Thakur et al., 2016), which Goldsmith and De Witt (2003) defined as the degree of influence a person has on others as a result of superior knowledge. In the context of innovativeness being viewed as a personal trait, Bruner and Kumar (2007) introduced gadget loving which combines the personal traits “opinion leadership” and “technological innovativeness”. According to their study, “a gadget lover is a consumer with a high intrinsic motivation to adopt and use a variety of leading-edge, technology-based goods, as well as the services that complement them” (Bruner and Kumar, 2007, p. 330), such as MP systems. With the growing influence of electronic word-of-mouth communication on consumer attitudes and purchase decisions in mind (Brown et al., 2007; Tang, 2017), the gadget lover represents a crucial customer in the process of the diffusion of innovation.

However, the role of gadget loving within the context of MP has not yet been investigated. Additionally, privacy research lacks an understanding of how gadget loving impacts the consumer’s privacy concerns. Through the adaption of the APCO-model for a MP context as well as by embedding the gadget loving construct into the APCO-model, our research combines three calls for research of the introduced domains. First of all, we followed the suggestion of Dahlberg et al. (2015) and integrated privacy research into the field of MP, which is in line with the call for research of Dinev et al. (2015) to consider the context of privacy decisions. Additionally, the integration of Roger’s (2003) DOI theory enhances privacy theory and enables us to develop more target-oriented implications for the practice.

3 Theoretical Framework and Hypotheses

3.1 An APCO-model for mobile payment services

In order to investigate the intention to use MP solutions, we based our research model on the enhanced APCO-model of Dinev et al. (2015). Dinev et al. (2015) encourage the research community to use the enhanced APCO-model as a starting point for the investigation of privacy related research questions and to apply the underlying structure of the triad of Antecedents, Privacy Concerns and Outcomes. According to current research in the field of privacy (Xu et al., 2008; Smith et al., 1996), we established privacy concerns (PC) as the central component in the model as a second-order construct for the field of MP solutions. This is vital, as current research models in MP are unsatisfactory to validate this construct in a suitable way. According to previous theoretical and empirical results in privacy research (Malhotra et al., 2004; Xu et al., 2012), we analyzed privacy concerns as a second-order factor within Internet or mobile services. Stewart and Segars (2002) were able to illustrate that the CFIP proposed by Smith et al. (1996) exhibit better psychometric properties when established as a second-order construct. Additionally, Bélanger and Crossler (2011) emphasized that for instance the second-order factor IUIPC of Malhotra et al. (2004) is being underutilized by researchers. Due to the context of mobile applications, we used the framework of Xu et al. (2012) to analyze privacy concerns for mobile services as a second-order factor.

Following the information boundary theory (Xu et al., 2008), privacy concerns can be explained through antecedents such as individual privacy experience and awareness, individual differences regarding personality, demographics as well as cultural differences (Smith et al., 1996; Smith et al., 2011; Dinev et al., 2015). The individual’s privacy concerns are shaped according to these antecedents (Smith et al., 2011). As individual differences regarding personality are proposed to predict privacy concerns (Dinev et al., 2015), our study includes the constructs of trust (TR) of Shih et al. (2012) and gadget loving (GL) of Bruner and Kumar (2007) as antecedents of privacy concerns. Since we are interested in the

precursors of privacy concerns, we integrated the importance of trust in the (intentional) use of information systems according to Shih et al. (2012). The integration of gadget loving is vital, as the reasons of adopting innovations from first users play a decisive role in the process of dissemination (Rogers, 2003; McDonald and Alpert, 2007; Tobbin and Adjei, 2012) and therefore, a deeper understanding of these consumers is crucial for MP system providers and researchers.

The second and much larger branch of research investigated the right-hand side of the APCO-model. Herein, privacy concerns are established as an independent variable viewing all other outcomes as dependent variables. The most important variables are the ones associated with behavioral reaction to the consumer's privacy concerns, such as the use of a certain technology. As the construct "behavioral intention" (BI) has been shown to be the most important dependent variable to predict the actual acceptance of technologies (Venkatesh et al., 2003), we integrated this variable as an outcome variable of the APCO-model.

Another vital variable influencing behavioral intention is the construct "privacy calculus", which is determined by a privacy trade-off between risks and benefits (Laufer and Wolfe, 1977). The privacy calculus perspective suggests that individuals deliberate on the risk involved and the potential benefits received when they are asked to reveal personal information to others (Dinev and Hart, 2006; Chellappa and Sin, 2005). Regarding MP, risks were defined as "financial risks" (FR) as MP is a new IS in the field of finance. According to the privacy calculus, "personalization" (PE) and "convenience benefits" (CB) were defined as the beneficial factors of the usage of MP (Tossell et al., 2012). As MP systems are able to analyze data regarding the consumer's purchasing attitudes, the personalization of the systems through the insertion of coupons is integrated as a driver of the intention to use such services. The second factor "convenience benefits" refers to benefits regarding the usefulness and ease of use of MP and is therefore an essential predictor according to established acceptance theories, such as the TAM (Davis, 1989) or the UTAUT (Venkatesh et al., 2003).

3.2 Hypotheses

Contrary to typical consumers, the gadget lover's motivation to adopt new products and services is driven by intrinsic rather than social factors (Bruner and Kumar, 2007). Therefore, the variable "gadget loving" describes a personal trait of consumers who experience a more enduring involvement and enjoyment when using new technology (Bruner and Kumar, 2007). Gadget loving consumers are passionate about owning and using high-tech products and tend to adopt them relatively early (Bruner and Kumar, 2007). Therefore, they show a high level of technological innovativeness (Bruner and Kumar, 2007), which as a part of domain-specific innovativeness mediates the relationship between personal innovativeness and innovative behavior regarding novel products and services (Roehrich, 2004). Herein, innovativeness can be viewed as a consumer's predisposition towards innovative behavior (Im et al., 2003; Goldsmith et al., 1995), for instance the usage of MP or the intention to use MP. It is also assumed that the propensity to innovate is a behavioral response to a certain context, which can be predicted by individuals interests or experience (Vishwanath, 2005). Against the background of gadget lovers showing a high level of interest and experience as well as a high level of technological innovativeness, we assume:

H1: Gadget loving positively affects the behavioral intention to use MP.

According to Dinev et al. (2015), the privacy concerns' antecedent factors are related to personal traits or demographics. As gadget loving describes a personal trait (Bruner and Kumar, 2007), we additionally assume a direct relationship between gadget loving and the consumer's privacy concerns in the MP context. Particularly within the context of financial decision making, the level of risk-taking behavior plays a vital role (Kim et al., 2010; Linck et al., 2006). Researchers claim that users with a high level of innovativeness are more willing to take risks and deal with the uncertainty of innovations (Rogers, 2003; Steenkamp et al., 1999). This is particularly true for gadget loving consumers, as these consumers tend to be highly excited about using new products and services and may put less effort in thinking about their privacy or risks (Thakur et al., 2016). When thinking about MP services, these consumers may feel high enjoyment and appreciate getting involved with the technology rather than perceiving intrusion,

surveillance or concerns regarding a potential future loss of their personal data. Additionally, gadget lovers are regarded as more knowledgeable about new services and products as they spend more time exploring and using them compared to typical customers (Shoham and Pesämaa, 2013). It is likely that gadget loving consumers have already used similar services and made prior experience, which is demonstrated to be an antecedent of privacy concerns (Dinev et al., 2015). If these experiences were perceived positive, this helps to alleviate the consumer's general privacy concerns, as it reduces the perceived privacy risks (Li, 2011). Due to the correlation between gadget loving and previous experience as well as the variable being a personal trait, we presume that higher levels of gadget loving will lead to lower levels of privacy concerns regarding MP.

H2: Gadget loving negatively affects privacy concerns.

Privacy concerns are considered as a proxy for privacy behavior (Bélanger and Crossler, 2011; Smith et al., 2011; Xu et al., 2012). As they are defined as the users' concerns regarding a possible loss of data as a result of the disclosure of personal information (Dinev and Hart, 2006), we assume that privacy concerns have a direct impact on the acceptance and usage of MP services. Therefore, high privacy concerns result in a negative tentative appraisal regarding the MP technology and reduce the likelihood to use such services. Following this line of reasoning, privacy concerns negatively affect the intention to use MP (Dinev et al., 2015). Consequently, we hypothesize:

H3: Privacy concerns negatively affect the behavioral intention to use MP.

Research indicates that there is no need for trust with-out the perception of risk or expectations of vulnerabilities (Mayer et al., 1995). In general, trust can be described as an attitude or belief about the intentions of a specific other (McKnight et al., 1998) and a lack of trust in the payment system has been identified to be one of the main barriers of electronic commerce transactions (Pavlou, 2003; Siau et al., 2004). Since MP solutions are hesitantly accepted and the underlying systems and providers are yet unknown, users are not able to build trust-relations. However, a fundamental characteristic of users is their individual importance and disposition to trust, which determines how they perceive the usage of an information system (Shih et al., 2012; Xu et al., 2008). As an antecedent of privacy issues in an MP context, trust can be assessed by the individual importance for a reliable reputation and a suitable privacy declaration of an MP provider. Accordingly, users with a higher need for trust are assumed to show higher levels of privacy concerns as they might question the company's responsible handling of personal data to a greater extent. We presume, that higher individual needs for verbal or written statements of MP companies are likely to assess a higher level of individual skepticism towards a responsible handling of personal data, which results in higher privacy concerns. This assumption is supported by Xu et al. (2008), who identified that privacy issues can be dampened by establishing a data protection declaration and an appropriate privacy policy within the company (Xu et al., 2008). Consequently, we suggest the importance of trust as an antecedent of privacy concerns and assume a positive effect.

H4: Trust positively affects privacy concerns.

As privacy concerns are defined as concerns of users about a possible future loss when disclosing personal information (Dinev and Hart, 2006), the potential loss has to be associated with the disclosed type of information. In the field of MP, privacy concerns can be the result of high uncertainties and a high-risk perception (Dinev et al., 2015; Grazioli and Jarvenpaa, 2000). Due to the use and functionality of MP applications, the users' perception of risk is mainly focused on financial losses. Accordingly, the disclosure and use of personal information is highly correlated with the personal financial circumstances, the spending behavior of users, and the associated data access. Therefore, we suggest:

H5: Privacy concerns positively affect the perception of financial risks.

Due to the nature of modern IS, users must disclose personal information to actively participate in the system. As IS have evolved as user-centered systems (Yoo, 2010), one of the users' perceived values is the possibility of personalization (Tossell et al., 2012). Within various information systems, the users actively contribute to the value creation in the sense of a co-creation by disclosing their personal data (Vargo et al., 2011). By disclosing personal data, they enable the value proposition of digital services (Mai, 2016). With the personalization of MP systems, users receive a higher level of convenience benefits, perceive a higher level of everyday life integration, and therewith perceive a higher level of

satisfaction regarding their individual needs. As users are seen as part of IS (Yoo, 2010), the need of personalization goes in line with a higher level of the disclosure of personal data. Consequently, privacy concerns are mitigated, as users perceive a need of personalization stronger than the concern about a possible future loss (Dinev and Hart, 2006). Subsequently, we hypothesize:

H6: Privacy concerns negatively affect personalization.

According to a representative study conducted by PwC in 2016, 85 percent of German citizens consider MP as a risky method of payment due to the possibility of hacking or abuse of personal and financial data. An equal share sees a risk in the smartphone being stolen and used for MP to the actual owner's detriment (PwC, 2016). Consumers also see an operational risk in the technical systems involved in the payment process, as they could fail during the transaction process and thus, prevent data exchange (Bernet, 2014; Khodawandi et al., 2003). Furthermore, Bernet (2014) and Khodawandi et al. (2003) identified the perceived risk and the subjective uncertainty, respectively, as the most important acceptance barrier for MP systems. Schierz et al. (2010) also demonstrate a significant influence of risk on the consumer's intention to use in the context of MP. Therefore, we included financial risk as an outcome of privacy concerns and an antecedent of the intention to use MP solutions.

H7: Financial risk negatively affects the behavioral intention to use MP services.

As modern IS and mobile services, such as MP services, are part of the era of experiential computing they become more and more ubiquitous in the everyday life of consumers (Yoo, 2010). As a consequence, users integrate digital services as a matter of course in their everyday lives. Without manually feeding their devices with data and information (Tossell et al., 2012; Ha et al., 2015), mobile services process the users' most sensitive data (Borriello, 2008; Zhao and Wang, 2011) and personalize their services. These personalized services, such as functions that enable consumers to better control their own purchasing behavior in the context of MP, are perceived as valuable by consumers (Chellappa and Sin, 2005). If consumers perceived MP services to be beneficial regarding their personalized functions, their intention to use such services likely increases. Therefore, we propose the following hypothesis:

H8: Personalization positively affects the behavioral intention to use MP services.

Although the variable perceived usefulness has often been used in the context of MP (Dahlberg et al., 2015), it does not examine the benefits of mobile payment services over competing payment services. According to the DOI theory (Rogers, 2003), consumers only adopt technologies if they offer a unique advantage compared to existing market solutions. The more consumers benefit from the usage of MP applications in terms of time and convenience, the more they tend to adopt such systems. Similar relationships are proposed in the TAM (Davis, 1989) with perceived usefulness and ease of use as well as in UTAUT (Venkatesh et al., 2003) with the variables performance and effort expectancy. The direct effect of these variables on intention to use MP has been confirmed in numerous studies (Schierz et al., 2010; Yang et al., 2012). Therefore, we hypothesize:

H9: Convenience benefits positively affect the behavioral intention to use MP services.

As a result, we introduce our APCO-model for MP solutions, shown in figure 1.

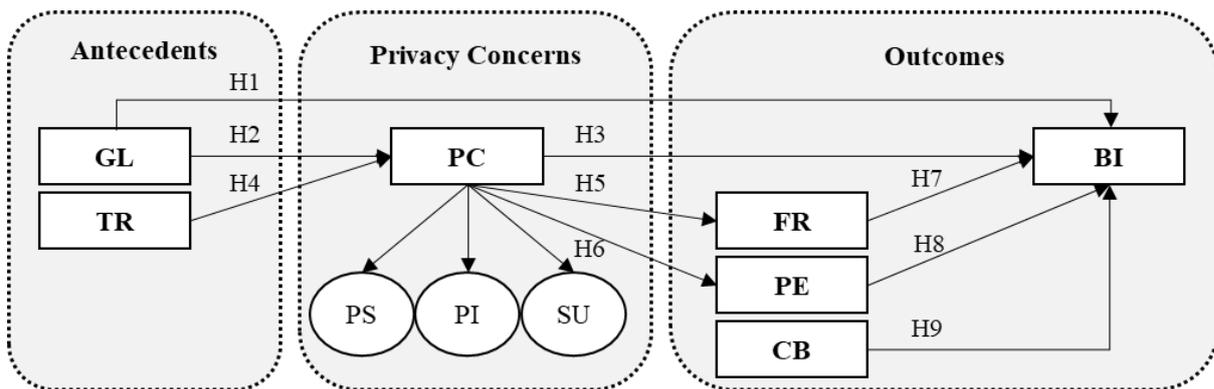


Figure 1. Proposed research model.

4 Research Design and Method

4.1 Operationalization of the constructs

All reflexive constructs in this study have been adapted from previously applied scales in IS research. The variable “perceived surveillance” (PS) has been adapted from Xu et al. (2012), “perceived intrusion” (PI) from Xu et al. (2008) and “secondary use of information” (SU) from the study of Smith et al. (1996), forming the second-order construct “privacy concerns” (PC). This approach is consistent with the study of Xu et al. (2012), who measured the “mobile user’ concerns for information privacy” as a second-order factor by using these variables. As antecedents, we used the items of Shih et al. (2012) to evaluate “trust” (TR) and the “gadget loving” (GL) scale of Bruner and Kumar (2007). The reflective measurement instruments of Shih et al. (2012) and Bruner and Kumar (2007) were shortened due to their length and the semantical redundancy of some items. This is a sensible approach, as all items of a reflective construct are caused by the same construct and illustrate high internal correlations. Therefore, any item can be left out of the evaluation, as long as sufficient reliability can be ensured (Hair et al., 2017). We used the study of Featherman and Pavlou (2003) for the variable “financial risks” (FR). The factors “personalization” (PE) and “convenience benefits” (CB) from the benefits of MP and were adapted from Xu et al. (2009) and Wagner et al. (2009) (Wagner et al., 2009). The dependent variable “behavioral intention” (BI) was measured using the scale of Venkatesh and Davis (2000). All items were measured using a 7-point Likert scale as this scale has been shown to reach the upper limits of the scale’s reliability (Allen and Seaman, 2007; Nunnally, 1967).

4.2 Data collection and sample

To collect data, we used an online survey, which took place from August 10th to September 10th 2018. We posted our questionnaire on social media and the network of a German university to recruit participants. To increase participation, we used three 20 Euro Amazon vouchers as incentives. In total, 466 subjects participated in our study and due to our control questions, a total of 380 completed questionnaires could be evaluated. In order to validate our survey, we conducted a pretest with a sample size of 27 participants. Hereby, we acquired useful feedback, which was implemented into the main survey. This helped to avoid uncertainties concerning the construct validity and to ensure an accurate understanding of MP among our respondents. 51.8 percent of the participants were female and 48.2 percent were male. We noted that mainly younger people had participated in the survey, with an average age of 29.1. Our sample shows a high educational level with more than 47 percent of the subjects having a university degree. To summarize, our sample is in line with the German population regarding the gender (Statistisches Bundesamt, 2018). With an average age of 29.1 years, we predominantly reached the so-called Digital Natives (Prensky, 2001). As this customer group is assumed to be less careful in disclosing their personal data (Reppel and Szmigin, 2010), the results of our study might be slightly biased compared to the entire German population. However, Digital Natives form a main target group

of innovative online financial services (Doering et al., 2015), making an analysis of their preferences a promising approach for offering essential insights to marketers.

5 Results

5.1 Measurement model

To test for reliability and validity of our scales, we analyzed Cronbach's alpha, composite reliability, convergent validity and discriminant validity. Additionally, an exploratory factor analysis was conducted and confirmed the assumed one-dimensionality of our variables. All constructs exceed the recommended threshold value of 0.70 (Nunnally, 1967) for Cronbach's alpha. Convergent validity was assessed on the basis of factor loadings, composite reliability and average variance extracted. Factor loadings should be over 0.5 (Fornell and Larcker, 1981; Hair et al., 1995), composite reliabilities over 0.8 (Nunnally et al., 1994) and the minimum for the average variance extracted is 0.5 (Barclay et al., 1995). We had to delete one item of trust due to its low factor loading. As shown in Table 1, all the criteria for reliability and convergent validity were met.

Construct	Item	Internal reliability	Convergent and discriminant validity		
		Cronbach's α	Factor loading	Composite reliability	Average variance extracted
Privacy concerns (PC) Second-order construct	Surveillance		0.967	0.904	0.760
	Intrusion		0.889		
	Secondary Use		0.744		
Trust (TR)	TRU 1	0.830	0.838	0.838	0.637
	TRU 2		0.878		
	TRU 3		0.661		
Financial risk (FR)	FR 1	0.831	0.842	0.836	0.630
	FR 2		0.838		
	FR 3		0.693		
Convenience benefits (CB)	CB 1	0.942	0.861	0.943	0.804
	CB 2		0.929		
	CB 3		0.910		
	CB 4		0.886		
Personalization (PE)	PER 1	0.907	0.810	0.909	0.770
	PER 2		0.937		
	PER 3		0.881		
Gadget loving (GL)	GL 1	0.935	0.893	0.937	0.788
	GL 2		0.884		
	GL 3		0.934		
	GL 4		0.837		
Behavioral intention to use (BI)	BI 1	0.954	0.972	0.955	0.913
	BI 2		0.939		

Table 1. Internal reliability and convergent validity of the measurements.

Discriminant validity is established by showing that the square roots of the AVEs exceed the corresponding off-diagonal inter-construct correlations (Lim et al., 2006) as illustrated in Table 2.

Construct	PC	TR	FR	CB	PE	GL	BI
PC	0.872						
TR	0.279	0.798					
FR	0.409	0.162	0.794				
CB	-0.092	-0.045	-0.114	0.897			
PE	0.046	-0.061	0.144	0.184	0.878		
GL	-0.082	0.090	-0.124	0.145	0.127	0.888	
BI	-0.320	-0.024	-0.249	0.625	0.137	0.273	0.956

Note: Diagonal elements in bold are the square roots of the average variance extracted.

Table 2. Inter-construct correlations and square roots of AVE.

To evaluate the measurement model's fit, we used a combination of model fit indices to reduce the risk of committing type 1 and type 2 errors as laid out in various simulation studies (Hoyle and Panter, 2000; Hu and Bentler, 1999; Sharma et al., 2005).

Herein, Barrett (2007, p. 817) concluded that the investigation of Hu and Bentler (1999) "has essentially become the 'bible' for the threshold cut-offs by most SEM investigators." Hu and Bentler (1999) suggest combining the Tucker-Lewis Index (TLI), the Incremental Fit Index (IFI), the Comparative Fit Index (CFI), as well as the Standardized Root Mean Square Residual (SRMR) to validate the model. In sum, this combination showed the lowest risk of committing type 1 and type 2 errors for case numbers between 150 and 5000. Additionally, we included the ratio χ^2 to the degrees of freedom (χ^2/df), the Normed Fit Index (NFI) and the Root Mean Square Error of Approximation (RMSEA). The $\chi^2/df = 1.795$, CFI = 0.966, NFI = 0.928, IFI = 0.967, TLI = 0.961, RMSEA = 0.046 and the SRMR = 0.051, which indicated a good model fit. Due to the use of a single method (online survey), we tested for common method bias. Here, we integrated a common latent factor to capture the common variance among all observed variables (Podsakoff et al., 2003). The comparison of the standardized regression weights from the model without the latent factor did not show significant differences to the model with the integrated latent factor, indicating that common method bias was not a great concern.

5.2 Structural model and hypothesis test

The same model fit indices were used to validate the structural model and demonstrated good outcomes. We also controlled for age and gender. The $\chi^2/df = 1.856$, CFI = 0.963, NFI = 0.923, IFI = .963, TLI = 0.958, RMSEA = 0.048 and the SRMR = 0.067. Table 3 summarizes the model fit indices of both models and shows the recommended thresholds for each fit index.

Fit index	Measurement model	Structural model	Recommended value
χ^2/df	1.795	1.856	≤ 3.00 (Homburg and Giering, 1996)
CFI	0.966	0.963	≥ 0.92 (Jöreskog and Sorbom, 1996)
NFI	0.928	0.923	≥ 0.90 (Fornell and Larcker, 1981)
IFI	0.967	0.963	≥ 0.90 (Bollen, 1989)
TLI	0.961	0.958	≥ 0.90 (Homburg and Baumgartner, 1995)
RMSEA	0.046	0.048	≤ 0.06 (Jöreskog and Sorbom, 1996)
SRMR	0.051	0.067	≤ 0.08 (Hu and Bentler, 1999)

Table 3. Model fit indices of the measurement and structural model.

The results of our evaluation indicate that our model achieved a high value of R^2 for intention to use MP $R^2(\text{BI}) = .475$. The analysis of the structural model illustrated that trust (H4, $\beta = .289$, $p < .001$) as well as gadget loving (H2, $\beta = -.113$, $p < .05$) could be confirmed as antecedents of privacy concerns. Our

model also revealed a direct positive effect of GL on BI (H1, $\beta = .160$, $p < .001$). PC as the core of our model yielded significant effects on BI (H3, $\beta = -.227$, $p < .001$) and FR (H5, $\beta = .414$, $p < .001$). The relationship between FR and BI was moderately significant (H7, $\beta = -.083$, $p < .1$). We could not confirm a significant relationship between PC and PE (H6, $\beta = .051$, n.s.). Additionally, PE did predict BI significantly (H9, $\beta = .046$, n.s.), rejecting H6 and H8. The variable CB showed the highest impact on BI (H9, $\beta = .577$, $p < .001$).

Variable	B	SE B	C.R.	B	P
H1: GL → BI	.203	.053	3.837	.160	<.001***
H2: GL → PC	-.110	.054	-2.041	-.113	<.05**
H3: PC → BI	-.295	.065	-4.558	-.227	<.001***
H4: TR → PC	.479	.102	4.714	.289	<.001***
H5: PC → FR	.371	.057	6.527	.414	<.001***
H6: PC → PE	.050	.058	0.865	.049	n.s.
H7: FR → BI	-.120	.071	-1.694	-.083	<.1*
H8: PE → BI	.051	.053	0.962	.040	n.s.
H9: CB → BI	.738	.059	12.562	.577	<.001***

Note: B = unstandardized coefficient, SE B = standard error B, C.R = critical ratio, β = standardized coefficient, p = p-value (* $p < .1$; ** $p < .05$; *** $p < .001$).

Table 4. Summary of the hypothesis test.

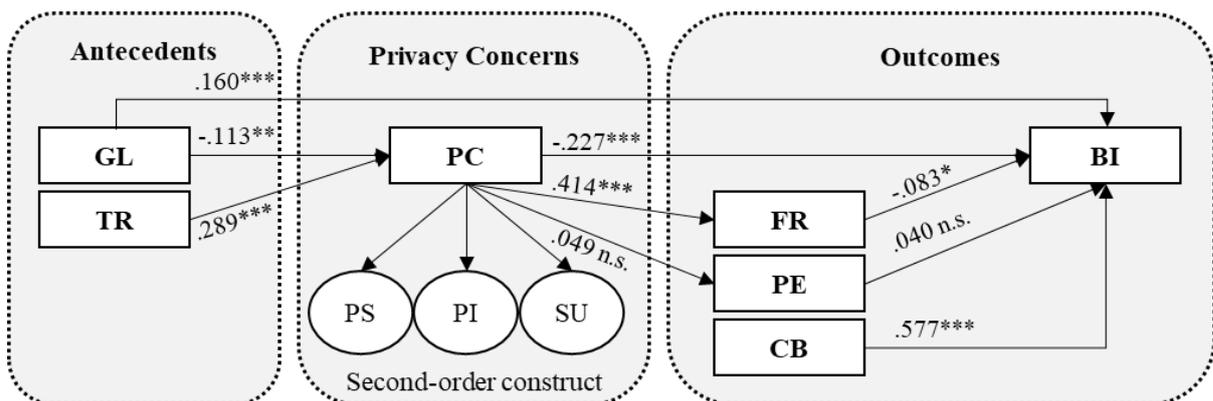


Figure 2. Research model and results with standardized regression weights (* $p < .1$; ** $p < .05$; *** $p < .001$).

6 Discussion

6.1 Theoretical and practical implications

The aim and motivation of our study was to achieve a deeper understanding of the consumer’s privacy concerns, their emergence in the context of MP solutions and their effects on the intended use, in order to draw relevant theoretical and practical implications. To further enhance the current state of research in MP, we addressed the call for research of Dahlberg et al. (2015) and based our model on the enhanced APCO model proposed by Dinev et al. (2015). This integration is supported by Dinev et al. (2015), who call for a contextual application of their macro model, such as in the context of MP. Additionally, our study integrated the DOI theory (Rogers, 2003) and investigated the influence of gadget loving (Bruner and Kumar, 2007) to overcome the privacy barriers and give target-oriented recommendations to providers of MP systems.

With regard to previous research in the field of MP, privacy concerns were established as a first-order construct (Slade et al., 2015; Lu et al., 2011; Thakur and Srivastava, 2014). We were able to identify

one study in the field of MP, which evaluated privacy concerns as a second-order construct. However, the study of Huang and Liu (2012 - 2012) evaluates the IUIPC of Malhotra et al. (2004) instead of investigating the more appropriate construct MUIPC of Xu et al. (2012) for mobile services. Consequently, the authors were not able to confirm a significant impact of privacy concerns on the consumer's intention to use. To conclude, our knowledge of the relationship between privacy concerns and behavioral intention to use MP is largely based on the evaluation of first-order factors, which limits the meaning of previous outcomes. Our study's investigation of the second-order construct MUIPC of Xu et al. (2012) contributes to more meaningful outcomes and strengthens the theory of privacy concerns being interpreted as a second-order latent reflective construct.

Furthermore, the study presented in this paper enriches the scarce literature on the antecedents of privacy concerns (Smith et al., 2011). Accordingly, the constructs trust and gadget loving can be highlighted as two influencing variables on privacy concerns in the context of the intended use of mobile payment solutions. While previous literature has examined the relationship between privacy and trust for individuals, organizations or systems (Smith et al., 2011), we identify the fundamental relevance of trust as an antecedent of the consumer's privacy concerns. This result is in line with the study of Xu et al. (2008), who identified the establishment of data protection declarations and an appropriate privacy policy within the company as antecedent factors.

With the integration of the construct gadget loving of Bruner and Kumar (2007) as an antecedent of privacy concerns, our study is the first to illustrate that the consumer's love of high-tech gadgets and intrinsic motivation to adopt technological innovations can mitigate the personal perception of privacy concerns. Additionally, the direct effect of gadget loving on intention to use MP could be confirmed. With the growing influence of electronic word-of-mouth communication on consumer attitudes and purchase decisions in mind (Brown et al., 2007; Tang, 2017), gadget lovers represent a crucial customer group in the process of the diffusion of innovations. Constructs of user acceptance, privacy research and the diffusion of innovations are crucial dimensions of the intention to use MP solutions. The study of Thakur and Srivastava (2014) also integrated personal innovativeness and confirmed its significant effect on behavioral intention, consistent with our result of gadget loving. Additionally, our results on gadget loving are similar to the analysis of Yang et al. (2012), who confirmed the effect of personal innovativeness on the behavioral intention to adopt MP.

With regard to the performance of the model fit indices, the model illustrated a good model fit and supports the establishment of privacy concerns as a second-order factor. Therefore, the APCO-framework can be applied to explain privacy concerns in the field of MP as a context of sensitive financial and personal data. Our theoretical approach is also strengthened by the results of the study of Kim et al. (2010), who attempted to establish privacy concerns as a first-order construct to predict security and trust for e-payment systems and concluded bad model fit indices.

For practitioners and providers of MP systems, the results of our study reveal a negative influence of privacy concerns on the intention to use MP, indicating the consumer's need for a responsible usage and storage of their personal data. Accordingly, we recommend dampening the consumer's privacy concerns by pronouncing a secure treatment of personal data in advertising messages. Another approach to reduce privacy concerns is the establishment of functional cyber security systems, as privacy issues and cyber security are related (Liu et al., 2012). Systems ensuring data security should be certified by independent organizations (Liu et al., 2012) to increase transparency and therefore the user's trust, which is an important antecedent of privacy concerns according to our results. This could also help to decrease the consumer's perception of financial risks, which negatively affect the intention to use MP.

In addition, a central implication for market entry strategies can be derived from the negative influence of gadget loving on privacy concerns as well as the positive direct impact of gadget loving on the intention to use MP solutions. As gadget loving plays a vital role in the process of adoption, MP providers should specifically address gadget lovers at the launching phase, as these consumers tend to adopt innovative services early and spread their benefits through word-of-mouth communication within their social system. Due to the gadget lover's low privacy related barriers, MP providers should address the functionality and convenience of their payment systems in a first step. After achieving a critical user

mass, providers should try to dampen consumers' privacy concerns by emphasizing a responsible usage and storage of their personal data. The outcomes of our study illustrate that consumers value their personal information when it comes to MP solutions. Therefore, an integration of cyber security systems could not only reduce privacy concerns, but also justify account management fees or service fees.

As convenience benefits yield to significantly impact the intention to use MP, providers are encouraged to ensure a fast, convenient and compatible functionality of their systems. Additionally, providers could introduce gamification functions (Hamari and Koivisto, 2015), which offer game-like services to the user and aim to influence their usage behavior (Hamari and Koivisto, 2013; Miller et al., 2016), such as easy money transfer to friends or an illustration of the consumer's expenditures in diagrams. These functions could not only improve the convenience benefits, but also increase the likelihood to use MP services among gadget lovers.

6.2 Conclusion, limitations and further research

With our study, we contribute to the growing debate on privacy in academic research and contextually integrated an enhanced APCO model (Dinev et al., 2015) into the field of MP. By integrating components from technology acceptance research and the diffusion of innovations, we provide a context-specific enhancement of the APCO model for mobile payment. The most remarkable results to emerge from the data can be seen on both sides of the model, seeing privacy concerns as a dependent and as an independent variable. The present study also describes gadget loving and trust as antecedents of privacy and thus enables a deeper understanding of both, the effects on privacy concerns and the effect of privacy concerns on the intention to use MP solutions.

We are aware that the research presented in this paper may have some limitations, which offer opportunities for further research. Given that the focus of our study was the evaluation of a comprehensive research model which combined different theoretical approaches with the goal of giving target-oriented recommendations for theory and practice, we focused on the group of Digital Natives. As this customer group is assumed to be less careful in disclosing their personal data (Reppel and Szmigin, 2010), the results of our study show a slight bias compared to the entire German population. Moreover, we were not able to consider cultural differences as the sample only consists of German respondents. To generalize the results, our model should be validated in a broader context regarding social and demographic factors.

Additionally, we were not able to investigate actual behavior, which could be considered in future research. Instead of actual behavior, we measured intention to use, herein following the opinion of a significant body of prior research in IS (Taylor and Todd, 1995; Venkatesh et al., 2003) that intention is a good predictor of actual behavior. A further limitation of our study is the usage of the personalization construct, which was lacking a precise understanding from the respondents' perspective and should be enhanced through concrete examples.

7 References

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