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Consumer Engagement and Behavioral Intention Toward Continuous Use of Innovative Mobile Banking Applications — A Case Study of Finland

Completed Research Paper

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Abstract

This study tests the effects of users' self-congruence and personal innovativeness on consumer engagement in the context of mobile banking (m-banking) and mobile payment (m-payment) applications. In addition, it examines the effects of engagement and perceived risk on continuous usage intention. We test our hypotheses with two convenience samples of users of m-banking and m-payment applications (total N=1516) using partial least squares structural equation modeling. The results show that a) self-congruence positively influences all three types of consumer engagement, b) personal innovativeness has a small effect on cognitive processing and affection, c) affection and activation have a positive impact on continuous usage intention, and d) perceived risk moderates the relationship between affection and continuous usage intention. The study contributes to the emerging consumer engagement literature and gives managerial insight into enhancing the level of consumer engagement and continuous usage intention of m-banking and m-payment applications.

Keywords: Consumer engagement, Mobile banking, Mobile payment, Self-congruence, Perceived risk, Continuous usage intention, Mobile applications

Introduction

Given the rapid innovation and development seen in mobile information systems and mobile finance, the ubiquitous characteristics of mobile banking (m-banking) and mobile payment (m-payment) applications, and the increasing consumer interest in adopting and using these applications for banking and payment purposes, mobile applications (m-applications) have gradually started to attract attention in academic research. In practice, m-applications have become an integral part of many consumers' daily life (Böhmer

et al. 2011). In the banking sector, the rise of m-applications is a natural part of the shift from over-the-counter services (such as branch banking) and ATMs to online banking.

Broadly speaking, m-banking is considered to be one of the innovative services offered by a financial services firm such as a bank for conducting financial (balance transfer, bill payment, making investments) and non-financial (balance inquiry, ATM location) transactions using a portable device, namely, a mobile phone, smartphone, or tablet (Shaikh and Karjaluoto 2015, 2016). These m-banking services can be offered either through short messaging services (SMS) or downloadable m-banking applications. An m-banking application requires an Internet connection on the mobile device, but SMS relies on standard Global System for Mobile Communication (GSM) networks (Shaikh and Karjaluoto 2015). Further, prior research (e.g., Shaw 2014; Shin 2009) has largely considered mobile wallet (m-wallet) to be a much-advanced versatile m-application that, unlike m-banking applications, includes several elements such as conducting mobile transactions or m-payments that contain information related to membership cards, loyalty cards, and travel cards, and that store personal and sensitive information, including passports, credit card information, PIN codes, and online shopping accounts that can be encrypted.

The concept of consumer engagement is an emerging and interesting topic. Indeed, the Marketing Science Institute (MSI) has named consumer engagement as a key research priority (MSI 2014). Within the context of this recent call for prioritizing customer engagement (CE), additional research into the topic has just started to emerge in marketing and IS literature. In the context of m-applications, CE can be defined as a consumer's positively valenced mobile–application related cognitive, emotional, and behavioral activity during or related to focal consumer and m-application interactions (Hollebeek et al. 2014). In the brand domain, Dwivedi (2015) recently discovered that consumer engagement can bring additional predictive power to loyalty intentions when the effects of satisfaction, perceived value, and perceived quality are controlled for. This emphasizes the immense value that the concept of engagement can offer to academics and practitioners in various contexts. Given that studies on CE have primarily been conceptual or qualitative (e.g., Bowden 2009; Brodie et al. 2011, 2013; van Doorn et al. 2010; Vivek et al. 2012) with a few exceptions (e.g., Dwivedi 2015; Hollebeek et al. 2014; Leckie et al. 2016), this study will contribute to the emerging literature on consumer engagement in the m-banking and m-payment context.

This study was conducted in Finland, which is considered one of the leading countries in online banking and mobile application use. Finland occupies a significant position in developing and deploying advanced wireless and digital banking infrastructure and has the lowest global costs for telecommunications network data. With respect to mobile devices, approximately 60 percent of users in Finland own a smartphone with access to the Internet, and 32 percent of Finnish households (approximately 5.4 million) use at least one tablet (Statistics Finland 2014). Despite this promising adoption and usage of portable devices, the personal computer has remained the most preferred device to access electronic banking services such as paying bills (Federation of Finnish Financial Services 2014). Against this backdrop, the purpose of this study is to examine the influence of cognitive (cognitive processing), emotional (affection), and behavioral (activation) engagement on consumers' intention toward continuous use of m-applications in Finland. We also study the role of perceived risk in the formation of behavioral intentions. Finally, we integrate two new constructs into the nomological network of consumer engagement: self-congruence and personal innovativeness, which are studied as antecedents of consumer engagement.

The paper is organized as follows: a theoretical framework is presented before detailing the research methods. Subsequently, we present the analysis and results. The concluding section discusses the implications of the findings for academics and practitioners, the limitations of the study, and directions for future research.

Theoretical Background

This study builds on the frameworks of service-dominant logic (Vargo and Lusch 2004, 2008), relationship marketing (Vivek et al. 2012), and technology acceptance (e.g., Kesharwani and Bisht 2012; Im et al. 2008). The basic tenet in our model is that consumer–service characteristics (self-congruence) and consumer–service category characteristics (personal innovativeness) holistically influence consumer engagement, because consumers are active co-creators of value (Vargo and Lusch 2004, 2008). Engagement is also characterized as feelings and experiences (cognitive and emotional engagement) (e.g., Brodie et al. 2011; Vivek et al. 2012; Hollebeek 2014) in addition to behavioral responses, and so it provides a means to retain existing customers and acquire new ones (Vivek et al. 2012). In general, several factors hinder the acceptance of new technology and the diffusion of innovations (see the TAM, UTAUT, UTAUT2, IDT models; e.g., Im et al. 2008; Kesharwani and Bisht 2012; Martins et al. 2014). Taking the context of this study (banking and payments in a mobile environment) into account, perceived risk is a relevant factor in determining the use of m-banking and payment applications (e.g., Luo et al. 2010; Chen 2013). Thus, perceived risk represents a potential direct counterbalance to consumer engagement.

The research model is illustrated in Figure 1, and it includes seven constructs and ten hypotheses in total. It should be noted that we do not hypothesize any relationship between personal innovativeness and activation, because activation measures the relation between usage of a specific m-application and usage of other m-applications in the given service category (see Hollebeek et al. 2014). If activation measured only behavior related to the specific mobile application (e.g., usage duration and frequency), then we would expect personal innovativeness and activation to be linked.

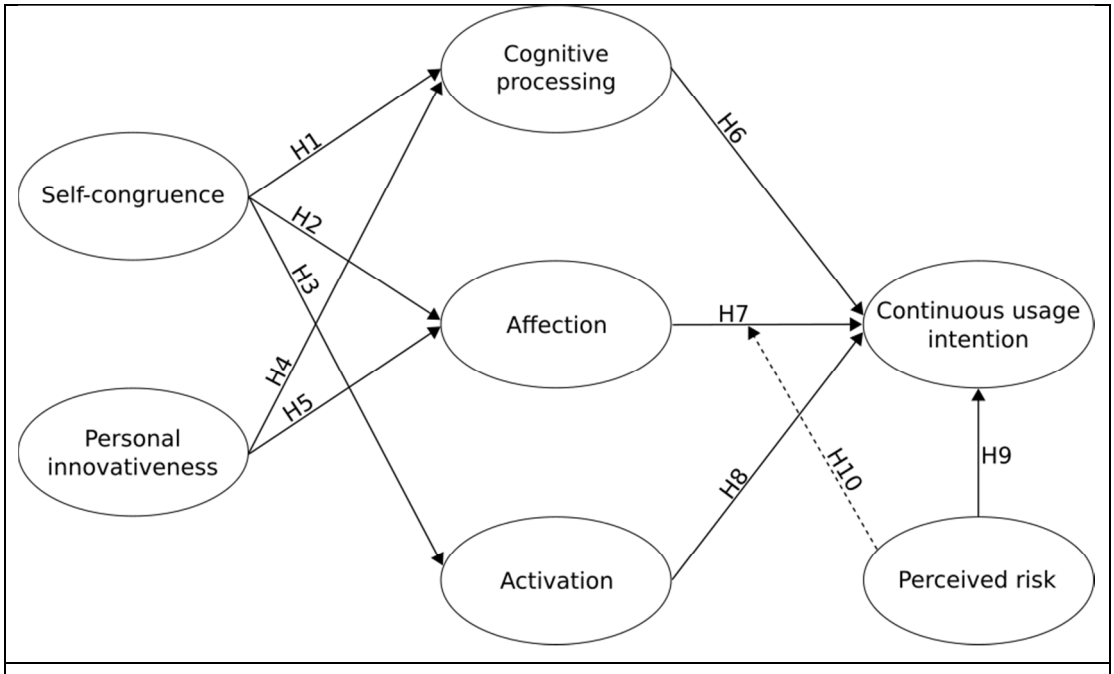

Figure 1. Research Model

Nature of Consumer Engagement

Although consumer engagement has not received much attention in the marketing domain until recently, it has been studied in other related academic disciplines, such as sociology, psychology, and organizational behavior (Brodie et al. 2011). Marketing researchers have started to study the phenomenon specifically in the service (e.g., Jaakkola and Alexander 2014; Calder et al. 2016) and mobile contexts (e.g.,

Kim et al. 2013a; Kim et al. 2013b). Although researchers have not yet reached a consensus on the nature of consumer engagement (see Table 1 for different definitions), engagement is generally considered to be based on interactions between the engagement subject and the engagement object (e.g., Hollebeek 2011; Brodie et al. 2011).

Table 1. Literature Review of Engagement

Author(s)	Term	Definition	Dimensionality
Calder et al. (2009)	Consumer engagement with website	A collection of experiences with the site.	Eight different experiences
Sprott et al. (2009)	Brand engagement in self-concept	A person's tendency to incorporate his or her own favorite brands into the self-concept.	Unidimensional
van Doorn et al. (2010)	Customer engagement (CE) behaviors	The customer's behavioral manifestation toward a brand or firm, beyond purchase, resulting from motivational drivers.	Behavioral
Brodie et al. (2011)	Customer engagement	A psychological state that occurs by virtue of interactive, co-creative customer experiences with a focal agent/object (e.g., a brand) in focal service relationships. It occurs under a specific set of context-dependent conditions generating differing CE levels and exists as a dynamic, iterative process within service relationships that co-create value. CE plays a central role in a nomological network governing service relationships in which other relational concepts (e.g., involvement, loyalty) are antecedents and/or consequences in iterative CE processes. It is a multidimensional concept subject to a context- and/or stakeholder-specific expression of relevant cognitive, emotional, and/or behavioral dimensions.	Cognitive, emotional, and behavioral
Hollebeek et al. (2014)	Consumer brand engagement	A consumer's positively valenced brand-related cognitive, emotional, and behavioral activity during or related to focal consumer–brand interactions.	Cognitive processing, affection and activation
Vivek et al. (2014)	Customer engagement	CE [Customer Engagement] goes beyond purchase and is the level of the customer's (or potential customer's) interactions and connections with the brand or firm's offerings or activities, often involving others in the social network created around the brand/offering/activity.	Conscious attention, enthusiastic participation and social connection
Dwivedi (2015)	Consumer brand engagement	Consumers' positive, fulfilling, brand–use related state of mind that is characterized by vigor, dedication, and absorption.	Vigor, dedication and absorption

Table 1. Literature Review of Engagement

Many researchers highlight the behavioral, cognitive, and emotional dimensions of consumer engagement (e.g., Brodie et al. 2011; Hollebeek et al. 2014; Dessart et al. 2015). In particular, Hollebeek et al. (2014) constructed a measurement scale for consumer engagement in the social media context and referred to these three dimensions as cognitive processing, affection, and activation. These dimensions are

theoretically and empirically separate constructs (Hollebeek et al. 2014), which means that their nomological network may differ, and they may or may not have different antecedents, outcomes, and moderators. In addition, they have varying roles in different contexts and thus lead to differing engagement levels (Brodie et al. 2011).

It is our perspective that Hollebeek et al. (2014) provide a fruitful conceptualization of consumer engagement in this study, because 1) their measurement scale was developed in a similar context (online services), and 2) the study captures the cognitive, emotional, and behavioral elements of consumer engagement that the recent literature emphasizes.

Self-congruence

The terms "self-congruence (SC)," "self-image congruence/congruity," "self-congruity," or "image-congruence" are used interchangeably in the consumer behavior and IS literature. The main attention of self-image congruity is focused on the image projected by various products and services (Sirgy 1982). Consequently, the term "self-congruity" is defined as the extent to which an individual's self-image is congruent with the typical brand-user image (Kim 2015; Sirgy 1982). In general, consumers are thought to prefer products with images that are congruent with their self-image (Swann 1983; Swann et al. 1990). Perhaps the notion that products have dimensions beyond functional utility is a singular contribution to consumer behavior (Landon 1974). Prior studies (e.g., Verone 2015; Thomas et al. 2015; Aguirre-Rodriguez et al. 2012) have shown that companies should not underestimate the power of SC due to its significant impact on consumer behavior and that SC is vital to achieve positive brand attachment and consistency over a long period of time (i.e., continuous use) as well as sustainable competitive advantage and brand equity.

The term "cognitive processing" concerns a consumer's level of m–application related thought processing and elaboration when interacting with a specific m-application (Hollebeek et al. 2014). Given that individuals view it important to verify, validate, and sustain their self-concepts (Swann 1983), the relationship between SC and cognitive processing can be explained through the increased motivation to elaborate consumer–mobile service interactions; in general, if consumers consider the m-application relevant or important to them, they are likely to exert greater cognitive efforts in analyzing the m–application related situations and further analyze them in greater detail (Greenwald and Leavitt 1984; Celsi and Olson 1988). For instance, Xue and Phelps (2013) studied SC in the advertising context and found that congruence between a consumer's self-concept and brand image in an ad will generate stronger brand interest (i.e., an increased motivation to invest cognitive resources). Thus, we propose the following hypothesis:

H1: SC positively influences cognitive processing

The term "affection" refers to the extent of a consumer's positive m–application related affect in a particular consumer and m-application interaction (Hollebeek et al. 2014). According to self-verification theory, consumers are motivated to verify, validate, and sustain their current self-concepts (Swann 1983; Swann et al. 1990). When consumers succeed in the pursuit of this goal, positive emotions should be elicited (Bagozzi et al. 1999). In two empirical studies, Malär et al. (2011) examined 167 brands and showed that a consumer's actual SC generates an emotional positive response toward the brand. In addition, Xue and Phelps (2013) found that the increased degree of congruence between a consumer's self-concept and the brand image in an ad leads to affective responses. Consequently, we pose the following hypothesis:

H2: SC positively influences affection

Activation is a consumer's level of energy, effort, and time spent on a specific mobile service (Hollebeek et al. 2014). In general, consumers tend to avoid experiences that pose a threat to their self-concept and, as a result, a motivational force pushes them away from such experiences (Swann 1983; Swann et al. 1990). Thus, consumers should be more likely to spend time using mobile services that they consider to be consistent with their self-concepts (Stern et al. 1977; Sirgy et al. 2000). Consistent with this reasoning, we propose the following hypothesis:

H3: SC positively influences activation

Personal Innovativeness

Personal innovativeness (PI) is a personality trait that refers to a consumer's technophilia or tendency to willingly embrace change and try new things (Lin and Filieri 2015). Generally, PI is defined as the willingness of an individual to try out any new information technology or information system (c.f. Agarwal and Prasad 1998). Users of information systems with this trait are willing to take chances, and they are able to cope with high levels of risk and uncertainty (Thakur et al. 2016).

Previous research has investigated PI in pre-adoption and post-adoption studies and demonstrated that PI has a moderating effect between perceptions about new information technology (IT) and intention to use new IT continuously (Hwang 2014). In line with Thakur and Srivastava (2014), as m-applications are a relatively new technology, the PI of consumers is expected to play an important role in the pre-adoption and continuous usage of an innovative product or service such as m-banking. For instance, Lu et al. (2005) revealed a strong relationship between social influences, PI, usefulness, and ease of use in the context of the intention to adopt wireless Internet services.

Given that personally innovative consumers have a willingness to try out new technologies (Agarwal and Prasad 1998; Lu et al. 2005; Lin and Filieri 2015), they should be likely to invest more cognitive resources in these interactions than consumers that are not as eager to test new technologies; PI can thus be viewed as a personal characteristic that provides an internal motivation (Agarwal and Prasad 1998; Lu et al. 2005). In accordance with this idea, Agarwal and Karahanna (2000) found that PI had a strong impact on cognitive absorption — deep involvement characterized by temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity — in the online technology context. Based on these findings, we propose the following hypothesis:

H4: PI positively influences cognitive processing

Similar to the relationship between PI and cognitive processing, the relationship between PI and affection can be examined from the motivational perspective. Given that PI provides an internal motivation to test new technologies (Agarwal and Prasad 1998; Lu et al. 2005), the use of newly introduced technology can be viewed as valuable *per se*, because it induces feelings and is fun (Holbrook and Hirschman 1982; Holbrook 2006). Because of the nature of the concept of PI, low-scoring consumers are unlikely to view the testing of new technologies as purely valuable. Personally innovative consumers also perceive the technologies to be more useful and easier to use than consumers that are not personally innovative (Lu et al. 2005), further eliciting more positive emotional responses in the case of personally innovative consumers. As has already been mentioned, Agarwal and Karahanna (2000) found a positive relationship between PI and cognitive absorption; in their model, cognitive absorption was modeled as including a dimension of heightened enjoyment, which resembles the emotional dimension of consumer engagement. This provides partial empirical support for the relationship. Thus, we pose the following hypothesis:

H5: PI positively influences affection

Engagement and Continuous Usage Intention

Observed consumer behavior is a function of different consumption values (Sheth et al. 1991). When consumers cognitively engage with the m-application, they have many brand-related thoughts during the focal interaction and are likely to be fully absorbed in the situation (Hollebeek et al. 2014; Dessart et al. 2015); the cognitive dimension of consumer engagement relates to positive experiences (Vivek et al. 2012; Hollebeek et al. 2014), which by themselves would offer a reason for the usage of a mobile service (Holbrook 2006). These types of immersive experiences are desirable for the consumer (Carù and Cova 2007). Similarly, Higgins and Scholer's (2009) regulatory engagement theory suggests that engagement, defined as being involved, occupied, fully absorbed, or engrossed (i.e., the cognitive dimension of engagement, cf. Hollebeek et al. 2014; Dwivedi 2015), creates a motivational force toward an object. However, contrary to their expectations, Hollebeek et al. (2014) found that cognitive processing did not affect the usage intention for social media. As the effect still remains somewhat unclear, we want to further examine it, and propose the following hypothesis:

H6: Cognitive processing is positively related to continuous usage intention

In general, the purpose of consumption may be to pursue fantasies, feelings, and fun (Holbrook and Hirschman 1982; Holbrook 2006). Consequently, positive emotional responses, such as pleasure, may

lead to approach responses (Mehrabian and Russell 1974). These types of approach behaviors relate to a desire to move toward, spend time in, and return to the specific environment (Donovan and Rossiter 1982); positive feelings during m-application usage should thus lead to an increased intention to keep using the mobile service. Several similar concepts, such as perceived enjoyment and emotional value, have empirically been linked to various behavioral intentions in the mobile service context (e.g., Nysveen et al. 2005; Liao et al. 2007; Pihlström and Brush 2008). Hollebeek et al. (2014) also found that affection has an influence on usage intention of social media. Hence, we propose the following hypothesis:

H7: Affection is positively related to continuous usage intention

Various studies (e.g., Speckart and Bentler 1982; Oullette and Wood 1998; Wu and Kuo 2008) have shown that past behavior can be used to predict future behavioral intentions. The explanations for this relationship vary; it is claimed that (1) individuals' traits, (2) individuals' desire to act consistently, (3) the attitude change that is caused by past behavior, and/or (4) the priming effect, in which past behavior increases the accessibility of the behavior in the memory, cause the predictive power of past behavior on future behavioral intention (see Trafimow and Borrie 1999). Consequently, if consumers have frequently used the specific m-application over other applications in a given category, they should report a higher intention to use that specific m-application in the future. Hollebeek et al. (2014) also specifically linked activation and usage intention in the social media context. Thus, we pose the following hypothesis:

H8: Activation is positively related to continuous usage intention

Perceived Risk and Continuous Usage Intention

Although perceived risk (PR) theory has been used to explain consumers' behavior since the early 1960s (Lee 2009), its inevitability was realized after the advent of online or e-commerce financial transactions in the recent past. Here Aldás-Manzano et al. (2011) found that the risk associated with possible losses arising from online banking transactions are greater than in traditional environments. Similar to these arguments, the Federal Reserve Bank (FRB 2012) explained that the consumer adoption of m-banking and m-payment technologies are impeded by security concerns and, therefore, consumer attitudes regarding whether m-banking or m-payment technologies are adequately secure is correlated with their use of these technologies.

Particularly in the context of online financial transactions, PR is defined as a perception about implicit risk in using the open Internet infrastructure to exchange private information (Chen 2013).

Earlier studies (e.g., Aldás-Manzano et al. 2009; Kesharwani and Bisht 2012; Martins et al. 2014) have vigorously debated the influence of PR on consumer purchase and usage intentions and examined its relationship to different antecedents such as continuous usage; in the majority of the studies, this relationship between PR and continuous usage was found to be negative. PR is an important factor affecting the customer's intention to use m-banking (Chen 2013) or Internet banking (Martins et al. 2014), and according to Laukkanen (2016), the intention to use online banking channels is adversely affected by different facets of PR, such as security risk, privacy risk, and financial risk. Furthermore, PR has been considered to be negatively related to buyers' repeat purchase intention (Chiu et al. 2014) and usage intention (Zhou 2013). Thus, it is hypothesized that:

H9: PR negatively influences continuous usage intention

Based on the current literature, we expect that PR moderates one relationship related to consumer engagement and continuous usage intention, namely, the affection-continuance intention relationship. The higher levels of PR may shift the consumers' focus from utilitarian gains to pleasurable experiences (O'Curry and Strahilevitz 2001; Chiu et al. 2014). This type of sensation-seeking behavior is reflected as a willingness to take risks to obtain such experiences (Zuckerman 1979; Arnett 1994), and customers may be less sensitive to utilitarian losses under such circumstances (Bowden 2009). Consequently, the effect of affection on continuous usage intention of an m-application should be higher when risks are perceived to be high. The effect of PR is very different from situations in which consumers expect to receive some sort of utilitarian gain (Chiu et al. 2014). Accordingly, we propose the following hypothesis:

H10: PR strengthens the relationship between affection and continuous usage intention

Method

Data Collection

The data were collected from m-banking and m-payment application users from Finland during a six-week period beginning in July 2015 (from 7/22/2015 to 9/3/2015). The data gathering focused on two types of m-applications: a typical m-banking application and a newly launched (late 2013) m-wallet application (called *Pivo*). In addition to information related to the personal banking account, the latter contains information about payment cards and users' favorite stores based on the current location. The questionnaire was made available on the participating banks' Facebook pages, meaning that the sampling method was convenience sampling. The survey items were first translated from English to Finnish by a researcher who was a native Finnish speaker. To ensure consistency, the items were back-translated into English by a different researcher. Slight changes to the items' wording were made in the screening process of the questionnaire. Lastly, three managers from a financial institution involved in the research checked that the items' wording matched the terms that the financial industry uses in its vocabulary.

A total of 1516 responses were received. The majority of them were m-banking application users (N=992), and the rest were m-wallet users (N=524). In terms of gender, both samples were almost equally split into female and male (Table 2). In terms of age, both samples were skewed toward younger respondents, as around one-fifth of the respondents were between 18 and 25, and over 60% were between 26 and 49. Less than 20% of the respondents were over 50. The respondents were experienced users of m-banking and m-wallet applications, as merely 11% had less than three months of experience with using the application. In the m-banking application sample, around 65% had experience of more than one year; in the m-wallet sample, three-fourths had used the application for more than six months. The majority of m-banking application users (66.8%) and m-wallet users (73.5) had used the application 1–3 days ago.

This sample mirrors the Finnish population well in terms of gender (of the adult population in Finland, 51% are female) and income (the average income in Finland is 2330 EUR), but it is skewed toward younger consumers, as around 83% were 18–49 (in the whole population, around 50% are 18–49) (Statistics Finland 2014). However, the samples are in line with previous studies on m-banking users in general (e.g., Luarn and Lin 2005; Laforet and Li 2005). To assess response bias, comparisons of early ($N_{m\text{-}banking}$ = 200; $N_{m\text{-}wallet}$ = 100) and late respondents (N = equivalent to the early respondents) were conducted. The Mann-Whitney U test did not reveal any statistically significant differences between the two groups at $p < 0.05$, except in the case of PR in the second sample. Based on further analyses[1], we do not consider nonresponse bias a severe issue in this study.

Table 2. Profile of Respondents

	m-banking		m-wallet	
	N	%	N	%
Gender				
Female	529	53.3	277	52.9
Male	463	46.7	247	47.1
Age				
18–25	180	18.1	114	21.8
26–34	278	28.0	172	32.8
35–49	344	34.7	164	31.3
50–64	165	16.6	64	12.2

[1] We later conducted a group comparison and found no differences between the two groups in terms of relationships that involve perceived risk.

65 or older	25	2.5	10	1.9
Monthly household income (gross EUR)				
Below 2000	181	18.3	114	21.8
2001–4000	337	33.9	191	36.4
4001–6000	239	24.1	109	20.8
6001–8000	153	15.5	73	13.9
8001 or more	82	8.2	37	7.1
Experience of use				
Less than 3 months	107	10.8	58	11.1
3–6 months	76	7.7	73	13.9
6–12 months	169	17.0	133	25.4
1–2 years	334	33.7	218	41.6
2–4 years	261	26.3	40	7.6
Over 4 years	45	4.5	2	0.4
Time from last usage				
1–3 days	663	66.8	385	73.5
4–7 days	128	12.9	78	14.9
Around 2 weeks	63	6.4	19	3.6
Around 1 month	40	4.0	10	1.9
Over 1 month	98	9.9	32	6.1

Table 2. Profile of Respondents

Measurement

We used established scales to measure the study constructs (see the Appendix A). The three items measuring SC were taken from Sirgy (1985). PI was measured with four items adopted from Lu et al. (2005). Cognitive processing, affection, and activation were measured using ten items in total that were adopted from Hollebeek et al. (2014). PR was measured with the scale used by Karjaluoto et al. (2014), including three items. Continuous usage intention was measured through the three items used by Zhou (2013).

Although the differences between the two groups are not hypothesized, we preferred to assess potential differences empirically, because the m-wallet application also offers other non–mobile banking related benefits. Establishing measurement invariance is a prerequisite of group comparisons (Rigdon et al. 2010; Vandenberg and Lance 2000). If measurement invariance is not established, the same constructs are not measured (Little 1997; Steinmetz et al. 2009), making the group comparison useless. We used the same indicators, treated the data identically, and applied identical settings to establish the configural invariance (Henseler et al. 2016). Next, we tested the compositional invariance using a nonparametric MICOM procedure with 5,000 permutations (Henseler et al. 2016). The c values of the multiple indicator measures were not significantly different from 1 ($p > 0.05$). Therefore, partial measurement invariance was established, and a group comparison could be conducted. Furthermore, we could not pool the data because some means and variances of the studied constructs differ among the two sub-groups (i.e., full measurement invariance was not established; Henseler et al. 2016).

Assessment of Common Method Bias

As with survey studies in general, common method bias is also present to some extent in this study. The marker variable approach was used to assess its effects on the study results (e.g., Lindell and Whitney 2001; Malhotra et al. 2006). A single item measure "I am going to stay being a customer of [the bank] also

in the future" on a seven-point Likert scale anchored by strongly disagree/strongly agree served as a marker, and this item was expected to be theoretically unrelated to indicators of PI. The highest correlations between the marker and the indicators of PI were 0.056 for the m-banking sample and 0.070 for the m-wallet sample (both $p > 0.05$). These correlations, which served as proxies for common method variance, were below the level that would significantly affect the studied structural relations (Malhotra et al. 2006). As a result, we do not consider common method variance a serious issue in this study.

Results

The structural model (Figure 1) was estimated using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 3.2 (Ringle et al. 2015). We find this method very applicable in this context due to our focus on predicting key target constructs and identifying key antecedents (see Hair et al. 2017). Given the recent appearance of the concept of consumer engagement in the consumer behavior (marketing) and information system contexts, the emphasis is on the exploration of the nomological network of consumer engagement through the selected constructs (i.e., theory development rather than theory confirmation). Therefore, PLS-SEM is a superior alternative over covariance-based techniques in this case. PLS is also less stringent with non-normal distribution of the data and multicollinearity of the variables and is ideal for exploratory models (Hair et al. 2017). Recent research also suggests that the differences between covariance-based SEM and PLS when estimating common factor model-based data are largely only marginal (Sarstedt et al. 2016). Next, we evaluated the quality of the PLS path model by examining the measurement models and the structural model.

Assessment of Measurement Models

The loadings of the manifest variables used were all significant ($p < 0.01$) and generally greater than 0.7 in both subsamples (Table 3). However, although the loadings did exceed the recommended level of 0.7 (Hair et al. 2011) in some cases, the average variance extracted (AVE) and composite reliability values were greater than the common threshold values of 0.50 and 0.70, respectively. As a result, we did not remove any indicators, in accordance with the suggestions by Henseler et al. (2009) and Hair et al. (2011). Discriminant validity was first examined using Fornell and Larcker's (1981) criterion. The square root of the AVE of each latent variable exceeded the correlations with all the other latent variables (Appendix B). In addition, an indicator level examination was conducted through the inspection of cross-loadings (Henseler et al. 2009). None of the indicators loaded more strongly to another latent variable than to their respective latent variable. Therefore, both the convergent and discriminant validity of the measurement models were achieved.

Table 3. Indicator Loadings and Descriptive Statistics

	m-banking		m-wallet	
	Loading	Mean (SD)	Loading	Mean (SD)
Self-congruence				
SC1	.878	5.60 (1.36)	.906	5.54 (1.34)
SC2	.900	4.99 (1.51)	.885	4.94 (1.54)
SC3	.877	5.16 (1.55)	.880	5.13 (1.46)
Personal Innovativeness				
PI1	.906	4.00 (1.84)	.923	4.30 (1.70)
PI2	.833	3.63 (1.82)	.834	3.92 (1.75)
PI3	.876	3.93 (1.94)	.878	4.39 (1.80)
PI4 [a]	.561	4.81 (1.75)	.423	4.91 (1.65)
Cognitive Processing				

COG1	.893	4.37 (1.67)	.894	4.48 (1.70)
COG2	.860	3.77 (1.57)	.887	3.96 (1.64)
COG3	.832	4.28 (1.57)	.856	4.48 (1.58)
Affection				
AFF1	.907	4.09 (1.45)	.920	4.22 (1.49)
AFF2	.896	4.04 (1.45)	.917	4.21 (1.50)
AFF3	.892	4.43 (1.55)	.909	4.39 (1.59)
AFF4	.903	4.30 (1.64)	.916	4.39 (1.66)
Activation				
ACT1	.751	4.12 (1.73)	.824	4.36 (1.80)
ACT2	.873	4.86 (1.84)	.899	4.70 (1.81)
ACT3	.825	4.69 (1.87)	.848	4.85 (1.80)
Perceived Risk				
PR1	.924	3.24 (1.67)	.902	3.10 (1.67)
PR2	.631	3.03 (1.47)	.602	3.15 (1.53)
PR3	.916	3.38 (1.71)	.888	3.15 (1.69)
Continuous Usage Intention				
USE1	.900	6.12 (1.33)	.896	6.02 (1.35)
USE2	.886	5.45 (1.60)	.815	5.02 (1.58)
USE3[a]	.802	6.20 (1.32)	.776	6.06 (1.37)

Notes: SD: standard deviation; [a]: initially reverse-coded.

Table 3. Indicator Loadings and Descriptive Statistics

Assessment of Structural Model

Next, we examined the structural relationships between the constructs (Figure 1). We evaluated the quality of the structural model through the target constructs' percentage of variance explained (R^2). We found that the values for cognitive processing ($R^2_{m\text{-}banking}$ = 0.235; $R^2_{m\text{-}wallet}$ = 0.286), affection ($R^2_{m\text{-}banking}$ = 0.323; $R^2_{m\text{-}wallet}$ = 0.346), and activation ($R^2_{m\text{-}banking}$ = 0.235; $R^2_{m\text{-}wallet}$ = 0.287) were at a low level. However, it should be taken into account that these constructs had only one or two predictor variables. In addition, around half of the variance in continuous usage intention was explained (Table 4). The blindfolding procedure was run so that Stone-Geisser criterion (Q^2) values could be obtained. All the values were above zero, indicating the model's predictive relevance (Henseler et al. 2009).

Statistical significance was evaluated through the bootstrapping procedure with 5,000 subsamples (Hair et al. 2011). In addition, the two-stage calculation method (the main effect PLS path model is estimated to obtain latent variable scores, after which the interaction term is calculated as the product of exogenous variables and the moderator) was used to examine moderating effects (Henseler and Chin 2010). We found that SC had a positive effect on each dimension of consumer engagement in both samples, supporting H1, H2, and H3 (Table 4). In addition, PI had a positive influence on cognitive processing and affection, supporting H4 and H5. The path coefficients and median effect size (f^2) values show that SC had a seemingly stronger impact on the specific dimensions of consumer engagement; the effect of PI was generally small., With respect to H6, our results mirror those from Hollebeek et al. (2014) as cognitive processing did not have an impact on continuous usage intention in either of the cases. Thus, H6 is not supported. However, affection and activation positively influenced continuous usage intention, supporting H7 and H8. PR also had a negative impact on continuous usage intention, as predicted by H9. Finally, the positive moderating effect of PR on the relationship between affection and continuous usage intention was established in both cases, supporting H10. Aguinis et al. (2005) found that the median effect size (f^2) for moderation is only 0.002. The effect size for the moderating effect of PR on the

relationship between affection and continuous usage intention is therefore substantial ($f^2_{m\text{-}banking}$ = 0.048; $f^2_{m\text{-}wallet}$ = 0.029). Further analyses showed that if age and gender were added as control variables for continuous usage intention, their effect was not significant ($p > 0.05$).

The group comparison was conducted using the partial least squares multi-group analysis (PLS-MGA) method with 5,000 subsamples; this is a nonparametric group comparison method in which the samples are exposed to separate bootstrap analyses (Henseler et al. 2009). In most of the cases, no differences between the groups were found. However, the relationship between activation and continuous usage intention was stronger for users of the m-wallet application than of the m-banking application ($\Delta\beta$ = 0.164, $p < 0.01$). Given that m-banking users tend to be more experienced than m-wallet users (Table 2), we further examined the role of user experience. Further analyses showed that the interaction effect of user experience and activation on continuous usage intention was negative ($\beta_{m\text{-}banking}$ = -0.088, $p < 0.01$; $\beta_{m\text{-}wallet}$ = -0.079, $p < 0.05$).

Notes: [a]: difference in path coefficients; [b]: p-values smaller than 0.05 or greater than 0.95

Table 4. Structural Model Estimates and Group Comparison

Structural relation	Group	*B*	*t*-value	f^2	Group difference[a]	*p*-value[b]
Direct effects						
SC → COG	m-banking m-wallet	.437*** .474***	14.692 11.681	.217 .289	.037ns	.768
SC → AFF	m-banking m-wallet	.528*** .520***	18.589 14.441	.357 .382	.007ns	.437
SC → ACT	m-banking m-wallet	.485*** .536***	16.736 14.685	.307 .402	.051ns	.861
PI → COG	m-banking m-wallet	.105*** .148***	3.263 3.708	.012 .028	.043ns	.804
PI →AFF	m-banking m-wallet	.093*** .165***	3.087 4.253	.011 .038	.072ns	.929
COG → USE	m-banking m-wallet	-.008ns -.087ns	0.211 1.627	.000 .005	.078ns	.117
AFF → USE	m-banking m-wallet	.288*** .308***	6.472 5.755	.041 .049	.020ns	.616
ACT → USE	m-banking m-wallet	.271*** .434***	8.639 9.447	.077 .184	.164***	.998
PR → USE	m-banking m-wallet	-.284*** -.241***	10.469 3.158	.134 .114	.043ns	.836
Moderating effect						
PR*AFF → USE	m-banking m-wallet	.140*** .106***	5.880 3.158	.048 .029	.033ns	.210

	m-banking		m-wallet		
Construct	R^2	Q^2	R^2	Q^2	
Cognitive processing	.235	.173	.286	.218	
Affection	.323	.259	.346	.288	
Activation	.235	.154	.287	.210	
Continuous usage intention	.459	.335	.514	.342	

are statistically significant; ***: $p < 0.01$ (two-tailed test); ns: not significant

Table 4. Structural Model Estimates and Group Comparison

Discussion

Consumer engagement has theoretical roots within the expanded domain of relationship marketing, which emphasizes the notions of interactivity, customer experience, and value co-creation (Vargo and Lusch, 2004, 2008; Vivek et al. 2012). The objective of this study was to develop and test a model investigating the ways in which consumer engagement and PR influence continuous use intentions in the context of m-banking and m-wallet applications. In addition, we examined how SC and PI are linked to consumer engagement. This study is among the first to examine the three dimensions of consumer engagement (i.e., cognitive [cognitive processing], emotional [affection], and behavioral [activation]) among m-banking and m-wallet application users. Overall, the findings of this study improve our understandings of the mechanics of consumer engagement in this specific context.

Theoretical Contributions

The nature of consumer engagement in terms of these three dimensions has barely been examined in the m-application context (cf. Kim et al. 2013b; Kim et al. 2013a). Our findings support a positive relationship between the emotional dimension of consumer engagement (affection) and continuous usage intention and between the behavioral dimension of consumer engagement (activation) and continuous usage intention. These results support prior findings in the brand domain (consumer brand engagement; e.g., Hollebeek et al. 2014; Dwivedi 2015). Furthermore, the relationship between activation and continuous usage intention was stronger for users of the m-wallet application. We did not hypothesize any theoretical reason that would explain this difference; the analysis of two different samples was simply driven by the lack of prerequisites to pool the data. However, further analyses showed that the higher level of m-banking users' experience appears to explain the difference.

The cognitive dimension of engagement (cognitive processing) did not have an impact on consumers' intention to use the m-banking application in the future. The previous literature has linked consumer engagement to loyalty (intentions) (Dwivedi 2015; Leckie et al. 2016) and usage intention (Hollebeek et al. 2014). The insignificant effect of cognitive processing is, however, in line with the findings of Hollebeek et al. (2014) and Leckie et al. (2016). This naturally raises questions regarding the operationalization of the cognitive dimension: is the measurement scale truly valid or does the cognitive dimension simply not lead to behavioral intentions or loyalty? All that can be said with certainty is that cognitive processing is highly correlated with the two other dimensions of consumer engagement, and the effect on continuous usage intention is insignificant when the effects of affection and activation are controlled for.

The study also found that the emotional and behavioral dimensions of consumer engagement were not particularly strong predictors of continuous usage intention. Therefore, consumer engagement was in no way a superior predictor of behavioral intention in this context. Considering the previous engagement research that studied the concept in the brand context, the results are more similar to those of Leckie et al. (2016) and Hollebeek et al. (2014) than of Dwivedi (2015).

Prior online banking studies (e.g., Lee 2009; Kesharwani and Bisht 2012) emphasized the negative impact of risk on behavioral intentions. As expected, the findings also showed that PR negatively influenced continuous usage intention in this context. Furthermore, the effect of affection on continuous usage intention was stronger when the risks were perceived as high. This finding is similar to that of Chiu et al. (2014), who found that PR strengthened the relationship between hedonic value and purchase intention in the B2C e-commerce context. Given that consumer engagement studies generally rely on the examination of direct effects (e.g., Hollebeek et al. 2014; Dwivedi 2015), this finding helps to understand the emerging concept of consumer engagement to a greater extent.

In addition, we identify SC and PI as antecedents of consumer engagement, thereby extending the nomological network of consumer engagement. SC was an antecedent of all three types of engagement, and PI influenced cognitive processing and affection. The effect of SC also seemed to be higher, although the variances in the engagement dimensions were not explained particularly well. Therefore, future research also should consider other predictors. However, it should be noted that these two variables do

not capture the actual service features; they relate to consumers' perceptions of typical users of the service and their willingness to try out new mobile services. Hence, these two factors can be considered relatively important.

Managerial Contributions

This study nonetheless offers valuable implications to business managers. First, the finding that SC is a strong driver of all the dimensions of consumer engagement in m-banking and m-wallet applications could be used as a branding tactic to appeal to the target segments of m-application users. Further, managers should carefully consider different customer segments and how they can modify or tailor the application to enhance the level of SC among their target segments. Although the effect of PI on cognitive processing and affection is rather small, companies may take this detail into account in specific circumstances, such as in an m-application launch.

In terms of engagement, managers should focus on the activation and affection processes, since cognitive processing does not have an effect on behavioral intention. Moreover, given that PR also positively moderates the relationship between affection and continuous usage intention, focusing on affection is a viable option in high-risk circumstances. Consequently, PR may benefit companies, because it shifts the focus of the emotional aspects of consumer and m-application interaction. Managers should keep this in mind, for example, when they introduce new types of m-applications. Naturally, reducing the level of PR contributes significantly to increasing the transaction volume on m-applications and reducing the negative effect on continuous usage intention of m-applications usage.

Third, we recommend that managers also use other constructs, such as those from UTAUT2 (Venkatesh et al. 2012), to predict and influence the level of continuous usage intention of an m-application. In this study, the three dimensions of engagement and PR predicted approximately half of the variance in continuous usage intention; although this level is acceptable, managers may improve the level of continuous usage intention by influencing other antecedents of behavioral intention.

Limitations and Future Research

Although the study was carefully designed and executed, it has some limitations that bear mentioning, many of which suggest opportunities for future research. First, the main limitation is related to its cross-sectional nature. This study is limited to a single demographic location, and the perceptions and usage intentions of m-applications' users were measured at a single point in time. Under these circumstances, it is difficult to elicit any generalizations from the study results, and there is a possibility that the results are not similar in other countries. Therefore, our hypotheses could also be examined with longitudinal research designs. In addition, future research may also consider replicating the research model in emerging markets, which have recently been flooded with m-banking and m-wallet models and applications.

Second, it is widely believed that the concept of consumer engagement is still in its infancy. Therefore, a more detailed analysis into the mechanism of the antecedents and outcomes of consumer engagement with m-banking applications is necessary to understand the nomological network of consumer engagement to greater extent than was possible in this study.

Third, the study sample is biased toward m-applications users, and non-users were not considered (Van der Heijden 2004). Certainly, a consumer's intention to use m-applications follows a different pattern from the thought processes of a user who does not have such an intention. Future research may investigate this issue.

Fourth, this study used traditional survey methodology, which has been widely and frequently used in previous studies (e.g., Shaikh and Karjaluoto 2015) examining m-applications. However, this type of survey methodology is considered weak when it comes to establishing the causal relationships among the variables. Future research, therefore, may consider using other research methodologies, such a experiments, to examine the direction of causal effects among the key variables in the context of m-applications.

Fifth, m-wallet applications provide some utilitarian benefits that are not related to m-banking. Additional studies in this direction will help to generalize the results to other utilitarian applications. A

comparison of primarily hedonic or utilitarian banking and payment applications could be a valuable research area in the future. In addition, considering the universal nature of mobile telephony and m-applications, a few cross-cultural studies examining and comparing the influence of consumer engagement on the adoption and continuous usage of m-applications could provide significant insights into the behavior and attitudes of the consumer.

Sixth, this study has considered m-banking and m-payment applications separately, however, the interoperability in relation to the host of services now offered separately through these m-applications is highly relevant. This interoperability between applications developed and offered by a single entity or bank largely implies that customers can use these two applications as a single application, and these applications can easily interface with or speak to each other seamlessly (Nyaga, 2014). For future research it would be interesting to explore the interoperability of m-applications and how this interoperability could bring convenience and value to drive customer behavior.

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Appendices

Appendix A. Survey Items
Self-congruence ($CR_{m\text{-}banking}$ = .916, $AVE_{m\text{-}banking}$ = .783; $CR_{m\text{-}wallet}$ = .920, $AVE_{m\text{-}wallet}$ = .793)
SC1 People similar to me use [m-banking/m-wallet application]
SC2 I can identify with people who prefer [m-banking/m-wallet application] to other forms of banking
SC3 The image of a typical user of [m-banking/m-wallet application] is highly consistent with how I see myself
Personal innovativeness ($CR_{m\text{-}banking}$ = .878, $AVE_{m\text{-}banking}$ = .649; $CR_{m\text{-}wallet}$ = .862, $AVE_{m\text{-}wallet}$ = .624)
PI1 If I heard about a new mobile application for financial and insurance services, I would look for ways to experiment with it
PI2 Among my peers, I am usually the first to explore new mobile financial and insurance applications on my smartphone and/or tablet
PI3 I like to experiment with new mobile applications for financial and insurance services
PI4 In general, I am hesitant to try out new mobile applications for financial and insurance services[1]
Cognitive processing ($CR_{m\text{-}banking}$ = .897, $AVE_{m\text{-}banking}$ = .743; $CR_{m\text{-}wallet}$ = .911, $AVE_{m\text{-}wallet}$ = .773)
COG1 Using [m-banking/m-wallet application] gets me to think about the app
COG2 I think about [m-banking/m-wallet application] a lot when I'm using it

COG3 Using [m-banking/m-wallet application] stimulates my interest to learn more about the app
Affection ($CR_{m\text{-}banking}$ = .944, $AVE_{m\text{-}banking}$ = .809; $CR_{m\text{-}wallet}$ = .954, $AVE_{m\text{-}wallet}$ = .838)
AFF1 I feel very positive when I use [m-banking/m-wallet application]
AFF2 Using [m-banking/m-wallet application] makes me happy
AFF3 I feel good when I use [m-banking/m-wallet application]
AFF4 I'm proud to use [m-banking/m-wallet application]
Activation ($CR_{m\text{-}banking}$ = .858, $AVE_{m\text{-}banking}$ = .669; $CR_{m\text{-}wallet}$ = .893, $AVE_{m\text{-}wallet}$ = .736)
ACT1 I spend a lot of time using [m-banking/m-wallet application], compared to other mobile financial and insurance services applications
ACT2 Whenever I'm using mobile financial and insurance application, I usually use [m-banking/m-wallet application]
ACT3 [M-banking/m-wallet application] is one of the services I usually use when I use mobile applications for financial and insurance services
Perceived risk ($CR_{m\text{-}banking}$ = .871, $AVE_{m\text{-}banking}$ = .697; $CR_{m\text{-}wallet}$ = .847, $AVE_{m\text{-}wallet}$ = .655)
PR1 I would worry about how reliable [m-banking/m-wallet application] would be
PR2 I would be afraid that [m-banking/m-wallet application] would not provide the benefits I expected
PR3 I am concerned about security risks of [m-banking/m-wallet application]
Continuous usage intention ($CR_{m\text{-}banking}$ = .898, $AVE_{m\text{-}banking}$ = .746; $CR_{m\text{-}wallet}$ = .869, $AVE_{m\text{-}wallet}$ = .690)
USE1 I intend to continue using [m-banking/m-wallet application] rather than discontinue its use
USE2 My intentions are to continue using [m-banking/m-wallet application] rather than use any alternative means
USE3 If I could, I would like to discontinue my use of [m-banking/m-wallet application][1]

Notes: CR: composite reliability; AVE: average variance extracted; [1]: reverse-coded. All items were measured using a 7-point Likert scale (strongly disagree – strongly agree).

Appendix A. Survey Items

Appendix B. Square Root of AVE (on the Diagonal) and Construct Correlations (Results for M-wallet Shown in Parentheses)

	SC	PI	COG	AFF	ACT	PR	USE
SC	.885 (.891)						
PI	.362 (.280)	.806 (.790)					
COG	.475 (.515)	.263 (.281)	.862 (.879)				
AFF	.561 (.567)	.284 (.311)	.822 (.833)	.900 (.916)			
ACT	.485 (.536)	.372 (.265)	.562 (.652)	.640 (.716)	.818 (.858)		
PR	-.296 (-.256)	-.133 (.004)	-.155 (-.121)	-.272 (-.193)	-.248 (-.174)	.835 (.809)	
USE	.636 (.597)	.288 (.196)	.435 (.469)	.540 (.583)	.544 (.637)	-.435 (-.365)	.864 (.830)

Notes: SC: self-congruence; PI: personal innovativeness; COG: cognitive processing; AFF: affection; ACT: activation; PR: perceived risk; USE: continuous usage intention.

Appendix B. Square Root of AVE (on the Diagonal) and Construct Correlations (Results for M-wallet Shown in Parentheses)