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Understanding Consumer Acceptance of Mobile-Retail

An empirical analysis of the revised technology acceptance model

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ABSTRACT

This study was motivated by the desire to identify relevant acceptance drivers of mobile-retail. An integrated model was presented that incorporated social influences, compatibility and mobility into the Technology Acceptance Model as indicators of consumers' intentions to use mobile-retail. The proposed model was empirically assessed using survey data from 513 students. Structural equations modeling (SEM) was utilized to test the causalities in this model. The results revealed that perceived usefulness, social influences and compatibility significantly affect intention to use mobile-retail. Among them, compatibility was found to be the strongest predictor. Additionally, perceived ease of use and compatibility were proven as strong indicators of perceived usefulness. On a different note, neither perceived ease of use nor mobility were found to significantly influence mobile-retail use. These findings provide several implications for managers, namely the ways in which mobile-retail needs to be marketed in order to increase its use.

1. Introduction

The phenomenal growth in Internet and in the number of smartphone users has resulted in an unparalleled growth in mobile-commerce. According to a recent prognosis (Internetworld, 2015), smartphone technology will dominate e-commerce in 2017. This is already evident in Asia where 45 % e-consumers have so far used a smartphone for online transactions (Criterio, 2014). As popularity has increased, so have variations of mobile-commerce services. In the business-to-consumer (B2C) sector examples include, mobile shopping (e.g. m-retailing, m-auctions and m-ticketing), mobile financial services (e.g. m-banking, m-brokering and m-payment), mobile entertainment (e.g. m-gaming, m-betting, m-music, and m-videos), and mobile information (e.g. weather forecasts, sports news, and maps) (Khalifa & Shen, 2008). Mobile-retail enables consumers to conduct purchases independent of time and place, unlike laptops and desktop computers that are somewhat restricted to place (Mathew et al., 2004). Thus, as a separate channel it delivers unique value to users by extending the boundaries set by traditional e-commerce devices (Raisinghani & Hanebeck, 2002; Balasubramanian et al., 2002). Even more, this feature facilitates mobile-retail's employment in a variety of contexts that can offer great financial potential to retail marketers.

Taking advantage of a sound IT and Internet infrastructure: 73 % smartphone users, 91 % Internet users and 88 % broadband users (SOI, 2014), Sweden is following the development in Asia. Swedes in general are quick to change their online habits (DIBS, 2014). In Sweden, smartphone technology is used primarily early on in the purchasing process, for information search, for inspiration, and as a way to communicate with brands and merchants (Google, 2013[1]). While users are researching on the handy device it is often abandoned for larger displays at the point of purchase (SOI, 2014). Consequently, only every fifth e-consumer has engaged in mobile-retail (E-barometern, 2014). Low conversion rates are mirrored by high abandonment rates; consumers constantly bounce between different devices. Recognizing this cross-device behavior and the growing importance of the mobile channel, many industries have started to mobile-optimize their websites (E-barometern, 2014). Some have adapted better to changed market conditions as evident by goods typically purchased via this channel (e.g. electronics, food, and clothing) (Google, 2013[2]).

In the mean time, mobile-retail environments still face challenges. Unsophisticated payment solutions, non-compatible websites, small screen-sizes, and a general lack of trust around credit card security (Google, 2013[1]) are listed as barriers that drive users away. Above all, issues connected to underdeveloped payment solutions prevent consumer usage. However, such issues are slowly being resolved due to, for instance, the recent introduction

of mobile BankID and MasterCard's simplified mobile-payment method "Masterpass" (Internetworld, 2014). These developments further point toward an upcoming rise in mobile-retail use. For retailers seeking to build or uphold a presence in the mobile channel, this implies that a deeper understanding of it needs to be developed. At firsthand it is vital to gain insights into consumers, since the continued success relies on their willingness to accept this alternative way of purchasing. By understanding consumers' acceptance behavior, managers can develop strategies to better suit their needs.

Furthermore, findings indicate (Statista, 2015) that Internet accessibility and smartphone proximity are reasons for mobile-retail use. As Patel et al. (2006) noted smartphones are often kept within arm's reach. Yet, research into mobile-retail acceptance is still in its beginning stages. Studies in the marketing area have instead been preoccupied with the adoption, acceptance and use of e.g. mobile-ticketing (Mallat et al., 2009; Brakewood et al., 2014), mobile-payments (Schierz et al., 2010; Yang et al., 2015), mobile-banking (Luarn & Lin, 2005; Gu et al., 2009), mobile-games (Ha et al., 2007; Zhou, 2013), mobile-shopping (Holmes et al., 2013; Ko et al., 2009), and mobile-commerce (Wu & Wang, 2005; Khalifa et al., 2012) in broader terms. Considering that no prior empirical study has explored mobile-retail acceptance, this current research seeks to answer the question: what determines consumers' use of mobile-retail? Extant research has relied heavily on the technology acceptance model (TAM) (Davis, 1989; Davis et al., 1989). Given that, TAM explains why users adopt a new system focusing; in particular, on utilitarian dimensions of acceptance, it is reasonable to assume its applicability in the case of mobile-retail. In this research, TAM is extended to include social influences, mobility and compatibility factors. In doing so, the purpose is to discern relevant drivers of mobile-retail use.

2. Literature review, research model and hypothesis

2.1 Technology Acceptance Model

Traditionally, the technology acceptance model (TAM) (Davis, 1989; Davis et al., 1989), has been used to predict individual's intention to buy and use a particular piece of technology. Based on the generic theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), designed to explain a variety of human behavior, TAM targets are limited applications to end-users. Davis (1989) postulated that TAM is a cost-benefit paradigm based on users' cognitive evaluations of the required effort of a certain action and its subsequent result. In its inception, the model was developed to explain employee acceptance of new technology (Chun et al., 2012). With the increase of smartphone users, it has also been embraced as overarching theory for mobile-commerce adoption.

The model consist of five constructs, including perceived usefulness, perceived ease of use, attitude towards use, behavioral intention to use, and actual system use (Davis et al., 1989). Further, it maintains that intention to adopt a system is determined by a user's attitude toward using that system, which in turn is predicted by his or hers perception of ease of use and usefulness. Numerous studies have replicated TAM and thus garnered it empirical support (e.g. Mathieson, 1991; Segars & Grover, 1993; Adams et al., 1992; Hendrickson et al., 1993; Szajna, 1996). Aforementioned research has demonstrated the explanatory power of the model in predicting use of various systems.

TAM-based studies have, however, been conducted from a task-oriented perspective. In contrast, mobile devices such as smartphones are closely connected to users' personal lives. On a different note, the success of mobile-retail lies in its capability in facilitating online transactions quickly and easily. Thus, it can be hypothesized that users will accept mobile-retail primarily because of its *ease of use* and *usefulness*. Besides the rewarded output, users are also fulfilled by a technology that is able to perform in any given situation. Consequently, flexibility and accessibility have been identified as vital determinants of mobile-commerce adoption (Kim et al., 2010). Likewise, the strong *mobility* of smartphone technology brings great convenience to users lives with which they can conduct commerce anywhere and at anytime (Mathew et al., 2004). Mobility is therefore included in this study to further enhance the understanding of why mobile-retail is accepted. Furthermore, for a large number of users smartphones are compatible with their lifestyles, values and needs. *Compatibility*, derived from Roger's (1983) diffusion of innovation (DOI) theory, is widely considered to positively influence innovation use (Moore & Benbasat, 1991; Agarwal & Prasad, 1998). Since users often enjoy a deep connection with their smartphones, it is logical to propose that they will seamlessly conduct retail transactions via this device. Accordingly, compatibility is introduced into this research's model. Users' consumption patterns are also shaped through social interaction. As Ajzen (1991) maintained, individuals in a society are influenced by others especially the crucial mass. Thus, in this study *social influences* as a factor is proposed to positively affect online transactions conducted on mobile devices. In

Figure 1 the proposed research model is depicted, based on a revised TAM, expanded to include mobility (Mathew et al., 2004), compatibility (Rogers, 1983) and social influences (Ajzen, 1991).

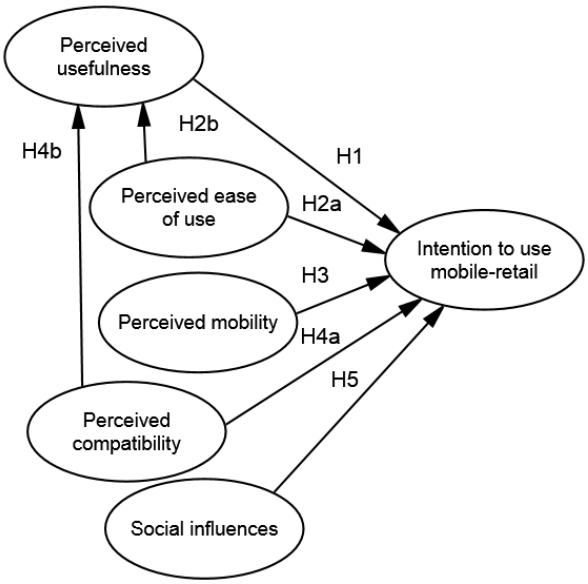

Fig.1. Proposed research model for mobile-retail use.

2.2 The influence of perceived usefulness and ease of use on mobile-retail use

Decision-making has become complex due to an increased range in products and brands. Individuals are now required to perform extensive information search prior to a purchase. The smartphone has come to fill this need by becoming a useful tool to search for information. In TAM and in studies that have replicated the model perceived usefulness, along with ease of use, is proposed as a fundamental antecedent to technology acceptance. As noted by Davis (1989), "people tend to use or not use an application to the extent they believe it will help them perform their job better" (p. 320). Perceived usefulness signifies, in this research, the degree to which a user believes that making purchases via a smartphone will improve his or hers performance (Davis, 1989). The relationship between usefulness and intention to adopt an application has been supported in prior studies (Segars & Grover, 1993; Szajna, 1996; Ha et al., 2007). It is, for instance, suggested that people accept mobile-games (Ha et al., 2007) or electronic mail systems (Szajna, 1996) when they are recognized as useful. Robust mobile functions are developing rapidly which results in efficient mobile-retail. These recent improvements have attracted many consumers to utilize smartphones for purchasing purposes. This assumption leads to the first hypothesis of this study:

H_1. A consumer's perceived usefulness of mobile-retail positively affects his or her intention to use mobile-retail.

In this research, perceived ease of use refers to the degree to which a consumer believes that shopping via a smartphone will be free of effort (Davis, 1989). Perceived ease of use has shown to play a vital role in determining intention to use (Gu et al., 2009; Kim et al., 2010; Revels et al., 2010). Gu et al. (2009), for instance, noted that the ease of use of mobile-banking positively influences its use. Likewise, Kim et al. (2010) found that the ease of use of mobile-payment services affects their use. Adoption of new technologies can however be prevented by complex features. Users are often unwilling to put aside the time needed to learn a new system (Rogers, 1983). Compared to desktop computers or laptops, smartphones have limited computing abilities, input buttons, memory, and battery power. Consumers thus face some complications when they use mobile-retail. Meanwhile, in recent years online retailers have begun to mobile-optimize their web pages during in which smartphones have become more user-friendly; screens for instance have gotten larger. Yet, very little research has investigated if the effect of ease with which a consumer can purchase via smartphone affects its use. Davis (1989) also identified the freedom from effort in using a system as an important predictor for its subsequent usefulness. As Venkatesh & Davis (2000) put forward, users that experience a technology as free of effort are prone to interpret it as useful. Favorable developments in smartphone technology tap into the ease and subsequent usefulness of mobile-retail. Based on this statement it is hypothesized:

H_{2a}. A consumer's perceived ease of use of mobile-retail positively affects his or her intention to use mobile-retail.

H_{2b}. A consumer's perceived ease of use of mobile-retail positively affects his or her perceived usefulness of mobile-retail.

2.3 Perceived mobility as indicator of mobile-retail acceptance

Human interactions have become increasingly mobile by intensive use of technologies in social lives and professional environments (Kakihara & Sørensen, 2001). People and organizations have been provided with the ability to work on the move and away from the office, dissolving any boundaries between home and work (Perry et al., 2001; Wajcam et al., 2008). The capacity of mobile technologies to function regardless of location has also changed users' mode

of action (Bittman et al., 2009). The devices are carried almost anywhere, in pockets, handbags and alike. However, as Perry et al. (2001) conclude, mobile technologies need to be flexible and adaptable to operate. Advanced technicality in smartphones enables such flexibility, through instant responsiveness and ubiquitous connectivity (Chun et al., 2012). For consumers, the unique characteristics of mobile devices such as instant connectivity have been proposed as predictors of usage intention (Lee & Park, 2006; Kim et al., 2010).

Furthermore, mobile-retail makes an excellent fit with a mobile lifestyle, providing a means to pay for goods in virtually any life situation. In a sense, it can be argued that consumers have always been mobile, traveling to stores to make a purchase. In this study, however, mobility is separated from the individual and tied to the benefits of technology; that is, time and place independent means of purchasing (Mathew et al., 2004). To date, only a handful of researchers have explored the connection between mobility and mobile-service acceptance (Mallat et al., 2009; Schierz et al., 2010; Kim et al., 2010). Schierz et al. (2010), for instance, identified a positive relationship between individual mobility and mobile-payment use. Further, Mallat et al. (2009) suggested that mobile-ticketing services are used in situations of haste, when alternatives are not available and the need for a ticket is unexpected. Similarly, transactions on smartphones might occur in circumstances of time constraints, such as while waiting for the bus or a traffic jam to clear. This is the case since smartphones often accompany their owners and are more readily available for use than traditional computers are. Guided by these assumptions it is hypothesized:

H_3. A consumer's perceived mobility of mobile-retail (defined as the belief that purchases on smartphones can be conducted regardless of time and place) positively affects his or her intention to use mobile-retail.

2.4 Perceived compatibility as indicator of mobile-retail acceptance

Smartphones have penetrated many domains of human activities including education, work, entertainment and social relationships. This diffusion will proceed to shape users values and experiences. Compatibility, one determinant of Roger's diffusion of innovation (DOI) theory, has been widely quoted in research that examines what assists the diffusion of innovative technologies (Mallat et al., 2009; Chen et al., 2002; Wu & Wang, 2005). Compatibility is defined as the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters (Rogers, 1983). Innovations are successful when users are able to adopt them seamlessly. The more compatible the innovation the faster the adoption rate will be. Many users have already integrated smartphones deeply into their lives. Some might even feel anxious to spend a day without their phone that carries their entire virtual presence and organizes their day-to-day activities. If a user perceives that, the device is compatible with his or her values and experiences, other mobile-services will be adopted. One prior empirical study (Mallat et al., 2009) suggested that compatibility has a positive effect on consumers' intention to use mobile-ticketing. Chen et al. (2002) explained that compatibility positively affects consumers' attitudes toward utilizing a virtual store. Moreover, Wu & Wang (2005) found it to be a major determinant of the adoption and subsequent perceived usefulness of mobile-commerce. To examine if it is consistent with the needs, values and past experiences of consumers to make a purchase via a smartphone, and if this compatible innovation is perceived as useful, the following hypothesis are derived:

H_{4a}. The perceived compatibility between using mobile-retail and a consumer's former experiences, values and needs positively affects his or her intention toward using mobile-retail.

H_{4b}. The perceived compatibility between using mobile-retail and a consumer's former experiences, values and needs positively affects his or her perceived usefulness of mobile-retail.

2.5 Social influences effects on mobile-retail use

New technologies are sometimes met with resistance; often the usefulness is questioned and compared to already existing devices. In situations such as these, social relations play a prominent role as positive reinforcers to first time users. Social influences are subtle and unaware forces in interpersonal relationships that individuals comply and conform to (Cialdini & Goldstein, 2004). They can take place in a variety of social settings, for instance, in the process of technology acceptance (Schmitz & Fulk, 1991). Since TAM was designed to foretell user acceptance of technologies within organizations, it does not validate emotionally or socially driven decisions (Chun et al., 2012). It is therefore advantageous to add this construct to TAM, and in relation to this research. In this present study, social influences denotes a user's belief that "important others", including classmates, friends and co-workers, think that he or she should use a smartphone when making a purchase (Venkatesh et al., 2003).

Unlike other constructs measured in this study, literature contains inconsistent findings on the impact of social factors on intention usage. Consequently, some studies have argued that social influences positively influence technology use (Taylor & Todd, 1995; Hsu & Lu, 2004; Khalifa et al., 2012), whereas other studies have suggested otherwise (Mathieson, 1991; Jaradat & Rababaa, 2013). For example, Hsu & Lu (2004) positively related social influences to the intention to play online games and Khalifa et al. (2012) to the individual acceptance of mobile-commerce. In the original TAM Davis et al. (1989) even dropped the construct noting, "further research is needed....to investigate conditions and mechanisms governing the impact of social influences on usage behavior" (p. 999). It has also been suggested that social relations are important in the introduction of new media (Webster & Trevino, 1995) and that voluntarily adopted technologies depend on their influence (Brown et al., 2002). Based on prior research and the notion that purchasing via a smartphone is in its infancy and thus relies heavily on voluntary adoption, this study proposes:

H_5. Social influences such as friends, classmates and co-workers positively affect a consumer's intention to use mobile-retail.

3. Research method

3.1 Measurement development

Intention to use mobile-retail in practice was measured through an online survey. Items were sourced from prior studies in order to ensure validity of the constructs. The scales for perceived usefulness (*PU1-4*) and perceived ease of use (*PEOU1-4*) were inspired by Davis (1989), which has been validated in numerous studies. Measures for mobility (*M1-3*) and compatibility (*C1-3*) were based on Mallat et al. (2009) with modified wordings to suit the area here. Items for social influences (*SI1-3)* were adapted from the research conducted by Hsu & Lu (2004). Measures for intention (*INT1-3*) were captured using scales from Revels et al. (2010). All items were adapted to suit the context of mobile-retail (Appendix A). The measures were formulated as five-point Likert scales with anchors ranging from (1) "strongly disagree" to (5) "strongly agree". 5-, 7- or 10-point scales are all comparable for analytical tools such as structural equations modeling (SEM) (Dawes, 2008). However, a five-point scale was chosen in order to ensure the readability of items. A point was also made to facilitate clarity on mobile devices. In a pretest phase, the questionnaire was reviewed by a small group of students at the School of Business Economics and Law in Gothenburg. Pretesting surveys is vital to ensure accurate results and, depending on length and complexity of the instruments measured, recommendations vary between 12-30 subjects (Presser & Blair, 1994; Hunt et al., 1982). In this current study, 12 students were deemed appropriate. Scales were modified slightly as a result of their suggestions. The final questionnaire consisted of 20 items measuring the 6 latent constructs.

3.2 Data collection & sample characteristics

The questionnaire was distributed as a web-based survey through Webropol via a private link to the target group: undergraduates and graduates enrolled spring 2015 at the School of Business, Economics and Law in Gothenburg. The survey consisted of two parts. In the first section, subjects' perception of each construct in the model was recorded. The second section captured subjects' demographic information, general e-commerce behavior and smartphone usage. In order to ensure that the subjects had the same understanding of what constitutes mobile-retail, as defined in this study, they were provided with examples. To utilize a student sample is advised against by some researchers (e.g. Burnett & Dunne, 1986) who claim that students should merely be sampled when they are the group of interest. Other researchers (e.g. Shuptrine, 1975), however, support the use of students in circumstances where they have knowledge and experience comparable with the population under study. In this research, students were of particular interest; one being frequent e-commerce and smartphone users; two being in the age of interest. Recent statistic indicates that mobile-retail use is highest in the 25-34 age groups (DIBS, 2014).

The survey was sent out to 4497 subjects. In total 513 responded which constitutes a response rate at 11.4 %. A higher rate might have been achieved if incentives had been used, as suggested by Fan & Yan (2010). Additionally, 299 subjects accessed the questionnaire without finishing it during the two weeks it was open for responses. All survey items were mandatory which might explain the high dropout rate. To examine if non-response bias occurred the variables age and gender were assessed. For age, no difference was found. However, compared to the target group (in brackets) the sample included 59.8 % (51 %) females and 40.2 % (49 %) males, indicating a slight deviation. Furthermore, as expected, the findings revealed that the subjects are frequent Internet shoppers and that the majority (91.8 %) perceive it as easy. The smartphone is predominantly used in school, public transport, outside and at home; for information search (86.5 %) and kept within near distance (90.8 %). Books,

clothes and travel are goods most likely purchased via the mobile channel. These features are consistent with the known profile of mobile-retail users, increasing the confidence of the generalizability of the findings under study. In Table I, sample characteristics are summarized.

Table I. Characteristics of subjects.

	Frequency	Percent	Cumulative
Gender			
Male	206	40.2	40.2
Female	307	59.8	100.0
Age			
< 21	67	13.1	13.1
21-25	274	53.4	66.5
>25	172	33.5	100.0
Educational level			
Independent courses	83	16.2	16,2
Bachelor	288	56.1	72.3
Magister	10	1.9	74.3
Master	113	22.0	96.3
Other	19	3.7	100.0
Engage in online shopping			
A few times			
a week	33	6.4	6.4
a month	219	42.7	49.1
per semester	155	30.2	79.3
a year	64	12.5	91.8
Never	42	8.2	100.0
Easy to shop via Internet			
Yes	471	91.8	91.8
No	21	4.1	95.9
Do not know	21	4.1	100.0
Use smartphone for information search			
Yes	444	86.5	86.5
No	50	9.7	96.3
Do not know	19	3.7	100.0
Never leave home without smartphone			
1.Completely disagree	6	1.2	1.2
2.	28	5.5	6.6
3.	13	2.5	9.2
4.	149	29.0	38.2
5.Completely agree	317	61.8	100.0

3.3 Descriptive statistics

The proposed research model consisted of 20 observed items measuring six constructs: perceived usefulness, perceived ease of use, compatibility, mobility, social influences and intention to use. Preliminarily, an exploratory factor analysis (EFA) using principal component analysis (PCA) with direct oblimin rotation method was employed to determine underlying dimensions of the 20 items. It is appropriate to utilize this method when there is reason to assume that constructs are correlated (Hair et al., 2010). Based on prior research it was expected that some constructs, such as the TAM factors would correlate. Two items were subsequently dropped from further analysis due to high cross loadings (Appendix A). The Cronbach's alphas (α) of the constructs were found reliable, ranging from 0.84 to 0.97 (Table III) and thus establishing inter-item reliability (Hair et al., 2010). Descriptive statistics (Table II) indicated that the mean of mobility was the highest (M = 3.82) while the mean of social influences was the lowest (M = 2.31). Further, it was found that subjects perceive it easy and useful to make a purchase via a smartphone. Although they in general view this channel as mobile, they were divided in this matter. On average, subjects scored low on items connected to social influences. Based on literature some ambivalence was expected. Similarly, subjects scored low yet divided on measures for intention, which is consistent with recent statistics suggesting that thus far only 20 % e-consumers have engaged in mobile-retail.

Table II. Descriptive Statistics.

Constructs	Items	Mean	S.D.
Usefulness	4	3.45	0.87
Ease of use	3	3.75	0.82
Mobility	2	3.82	1.11
Compatibility	3	2.65	1.09
Social influences	3	2.31	0.96
Intention	3	2.67	1.20

4. Data analysis and results

The proposed model was examined using structural equations modeling (SEM). A SEM approach was chosen as it is a powerful generalization of earlier statistical approaches with the key benefit in being able to assess both measurement properties and theoretical relationships in one technique (Hair et al., 2010). In addition, SEM can examine a series of dependence relationships simultaneously, which is a realistic representation of the constructs in this research. To test the hypothesis the measurement model and the structural model were developed and assessed separately. The measurement model was

used to establish convergent and discriminant validity of the constructs while the structural model was used to identify the causality among the theoretical factors.

4.1 Measurement model

The measurement model was evaluated for overall fit, convergent validity and discriminant validity with confirmatory factor analysis (CFA) using AMOS 22.0 statistical software. In the CFA, the constructs were allowed to covary and each item was modeled as a reflective indicator of its construct. Maximum likelihood (ML) procedure was chosen as the estimation method. In addition, several model fit-indices were used to assess the measurement model: goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normalized fit index (NFI), comparative fit index (CFI), RMS error of approximation (RMSEA) and chi-square (χ^2) divided by its degrees of freedom (d.f.), alike Ko et al. (2009), Gu et al. (2009) and Ha et al. (2007). The indices exhibited adequate fit of the model to the collected data: χ^2/ d.f. = 2.86, GFI = 0.93, AGFI = 0.90, NFI = 0.95, CFI = 0.97, RMSEA = 0.06, following the criteria set by Hair et al. (2010).

Convergent validity was evaluated via the assessment of factor loadings, composite reliability (CR) and the average variance extracted (AVE) (Hair et al., 2010). All factor loadings were greater than 0.71 and significant at $p < 0.001$. The composite reliabilities of the constructs ranged from 0.84 to 0.97, suggesting that the multi-item scales used to measure the constructs had satisfactory if not very good internal consistency. Finally, AVE estimates ranged from 0.63 to 0.91, indicating that the items adequately explained the variance. The convergent validity measures and their recommended acceptance criteria are displayed in Table III. Discriminant validity was examined to assess the extent to which each construct was truly distinct from others. AVE coefficients from the construct should be greater than the square of correlations between that and other constructs in the model to suggest discriminant validity (Hair et al., 2010). The largest shared variance between any pair of construct was 0.48 (usefulness and ease of use) while the smallest AVE was 0.63 (Appendix B). Thus, the results demonstrated adequate discriminant validity.

Table III. Measurement model results.

Construct validity measures.				
	Factor loading(s)[b]	Cronbach's α	CR[c]	AVE[d]
Criteria[a]	> 0.5	> 0.7	> 0.7	> 0.5
Usefulness		0.86	0.85	0.66
PU1	0.79			
PU2	0.81			
PU3	0.82			
PU4	0.71			
Ease of use		0.84	0.84	0.63
PEOU2	0.78			
PEOU3	0.81			
PEOU4	0.79			
Mobility		0.84	0.85	0.73
M1	0.92			
M2	0.79			
Compatibility		0.87	0.87	0.70
C1	0.87			
C2	0.88			
C3	0.75			
Social influences		0.97	0.97	0.91
SI1	0.93			
SI2	0.96			
SI3	0.97			
Intention to use		0.95	0.95	0.87
INT1	0.95			
INT2	0.99			
INT3	0.86			

[a] Proposed by Hair et al. (2010). [b] All significant at .001. [c] Composite reliability. [d] Average variance extracted.

4.2 Structural model

The structural model was examined in regards to measures of model fit, the overall explanatory power and the proposed causal links. Similar to the CFA each item was modeled in a reflective manner and the six constructs were linked as hypothesized (Figure 2). The model fit indices were comparable to the previous measurement model being: χ^2/ d.f. = 3.22, GFI = 0.93, AGFI = 0.89, NFI = 0.95, CFI = 0.96, RMSEA = 0.06 and thus falling within the recommended level set by Hair et al. (2010). The explanatory power of the structural model was estimated by examining the squared multiple correlations (R^2 values) of the two dependent variables perceived usefulness and intention to use. When combined, the paths from perceived ease of use and compatibility explained 56 % of the variance observed in the usefulness of mobile-retail. The estimated model accounted for 51 % variance observed in consumer's intentions to use mobile-retail. These explanation rates demonstrated satisfactory values.

Due to adequate model fit, the proposed model was deemed appropriate for hypothesis testing. In Figure 2, the results of the structural model are presented. Numbers represent the path coefficients (standardized beta weights) between constructs. With the exception of H_{2a} and H_3, all hypotheses were supported. For instance, the structural link from perceived usefulness to intention was found positive and significant (β = 0.25; $p < 0.001$), in support of H_1. However, the relationship proposed in H_{2a} was not confirmed; that is that perceived ease of use predicts intention. In support of H_{2b}, the results did provide strong evidence for the direct effects of perceived ease of use on perceived usefulness (β = 0.57; $p < 0.001$). This implied that perceived ease of use instead had an indirect significant effect on intention via perceived usefulness. Further, the path between mobility and intention was found insignificant. H_3 was therefore rejected. On a different note, compatibility was found to predict both intention to use mobile-retail (β = 0.57; $p < 0.001$) and perceived usefulness (β = 0.29; $p < 0.001$), as asserted in H_{4a} and H_{4b}. This also suggested that compatibility had an indirect effect on intention via perceived usefulness. Lastly, with the smallest magnitude, social influences were found to predict intention (β = 0.08; $p < 0.05$), as hypothesized in H_5. Hence, the findings of these tests revealed that H_1, H_{2b}, H_{4a}, H_{4b} and H_5 were all supported, with compatibility (H_{4a}; β = 0.57) contributing more to intention than any other construct. In addition, the supported hypothesis were all highly significant ($p < 0.001$) with the exception of social influences that showed significance at the $p < 0.05$ level.

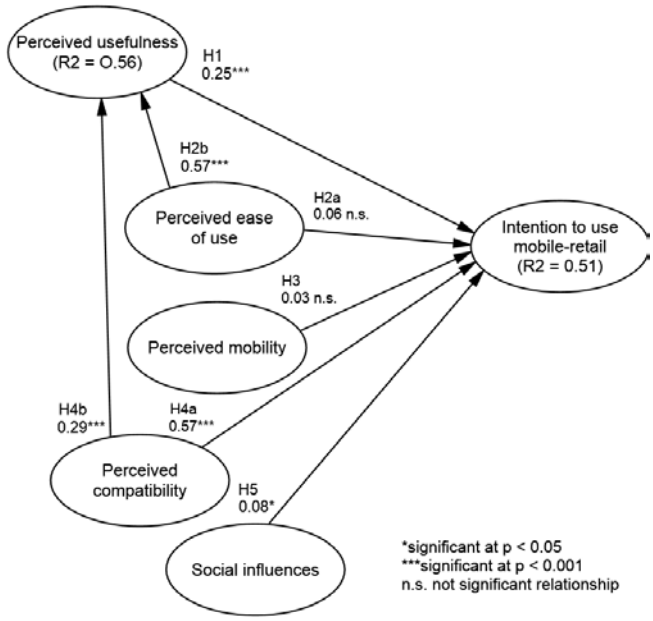

Fig. 2. The results of the structural model.

5. Discussion & conclusions

This study aimed to identify determinants of mobile-retail acceptance. An extended framework of TAM was presented with social influences, compatibility and mobility, as well as TAM constructs, as indicators of mobile-retail use. The proposed model was empirically assessed using data from a sample of frequent e-commerce and smartphone users. This data showed strong support for the validity of the model. Based on findings five insights into mobile-retail acceptance are provided.

First, consistent with prior TAM work, this study confirmed that perceived usefulness exerts a significant positive influence on intention to use mobile-retail. In general, consumers seek a means to minimize costs and maximize benefits of any purchase. Apparently, consumers obtain utilitarian gains when using smartphones for online-retail transactions. Such gains can be attributed to the technology and include, for example, continuous Internet access and the time saved not having to switch between devices. However, the amount of effort (cost) required to use mobile-retail must not exceed its benefits. If, for instance, the channel is experienced as slow or time-consuming (i.e. non-useful) it will be abandoned for other devices. Second, in contrast to extant TAM research but in accord with the findings of Wu & Wang (2005) and Szajna (1996), this study did not verify the connection between ease of use and intention to use mobile-retail. Moreover, the structural link was detected as indirect, working through usefulness, as

previous TAM research has pointed out. These findings imply that while impediments to mobile-retail use (e.g. issues with payment solutions) are slowly being dissolved, ease of use alone cannot entice usage intention. Instead, the user-friendliness of mobile-retail technology is closely knit with its practical use. Thus, solutions to barriers need to be of a dual nature; on one hand, they must simplify current issues; on the other hand, they need to be practical. In being such, consumers would be more prone to adopt this alternative way of purchasing. Furthermore, considering that subjects are regular Internet shoppers and experienced smartphone users, in part accounts for the findings under study.

Third, in this study mobility was not found to drive mobile-retail use. Past mobile-commerce research (Mallat et al., 2009; Schierz et al., 2010) has stressed the influence of mobility on usage intention. In the context of mobile-retail, current consumer behavior suggests otherwise. Seldom are retail purchases done while "on the run". Instead, similar to other devices, consumers shop via the smartphone while at home (Google, 2013[2]). Hence, the perceived mobility of smartphone technology does not give it a competitive edge over traditional e-commerce devices. However, the device's ability to provide access to product information anytime-anywhere has attracted many consumers to utilize it for this reason. Consequently, the smartphones importance is particularly emphasized early on in the purchasing process. Fourth, analytical results showed that compatibility predicted mobile-retail acceptance more than any other construct measured in this study. On a related note, Plouffe et al. (2001) found that characteristics derived from the diffusion of innovation (DOI) theory, explain adoption intention to a greater extent than traditional TAM constructs do. What's more, the construct was found to determine the perceived usefulness of mobile-retail corroborating previous findings (Chen et al., 2002; Wu & Wang, 2005). In general, most consumers are not quick to alter the manner in which they conduct purchases. Meanwhile, smartphones are a dominant presence in many users' lives. Users stick with the device, as they are able to apply it in many contexts from turning on the TV to reading one's blood pressure. From a purchasing perspective, it mirrors the function of other devices, such as laptops, albeit being less technically advanced. Hence, it can be concluded that consumers are comfortable with the technology and experience it as useful. Consequently, mobile-retail fits with users' current consumption practices and habits.

Fifth, this study showed that, although not as important as compatibility and usefulness, social influences significantly affect intention to use mobile-retail. Prior studies have exhibited ambivalence in regards to social factors impact on adoption intention. Notably, in the original TAM Davis et al. (1989) omitted the construct. Today, however, there is hype around mobile-purchases, especially through apps. This hype is intensified by an information-sharing society facilitated by the Internet. More than ever, consumers are able to share and absorb new consumption practices. This transparency allows consumers to see what others buy, like and use. Thus, it is reasonable to suspect that social influences, such as friends, drive mobile-retail use and will continue to do so in the foreseeable future.

From the findings three conclusions are drawn:
(1). The traditional TAM was restricted by its narrow perspective in the analysis of consumer behavior regarding mobile-retail usage as individual intentions tended to other variables.
(2). While compatibility is not part of TAM and therefore not often considered by adoption researchers this study verified it as the most important determinant of mobile-retail use.
(3). Whereas TAM omitted social factors in explaining individual technology acceptance, this study found that social influences affect mobile-retail acceptance.

6. Contribution & implications

For academic researchers these findings contribute to a theoretical understanding of factors that drive mobile-retail use that, to the best of our knowledge, have been ignored in past literature. Thus, the purpose pertained in this study has been fulfilled. However, it is important to note that this present study only represents a first step in understanding why consumers adopt mobile-retail. Nonetheless, it does extend the growing body of research in the field of mobile-commerce adoption through the advancement of TAM.

The results of this research also entail important practical implications for managers and marketers operating in the online-retail environment. First, consumers are very demanding and fickle in their expectations of technology and will not be lured easily into new technological areas, as indicated by the link between ease of use and usefulness. Thus, retailers seeking to build a presence in the mobile channel need to consider a utilitarian approach that; one, enhances the user-friendliness of mobile transactions; two, emphasizes the usefulness of this channel in all of their marketing material. Second, since mobile-retail is primarily used in the information search phase of the buyer decision-making process, actual purchases are often made on other devices. This cross-device behavior requires that managers build a strong presence on all channels,

including the mobile phone, to accommodate customer needs. Third, users often enjoy a deep connection with their smartphones yet resent dramatic changes brought about by new technology, as indicated in this study. New innovations such as mobile-retail needs to be introduced with caution and marketed in a way that users regard it as well suited with past experiences and current needs. Fourth, since mobile-retail usage is stimulated by social factors managers should identify early adopters and entice their usage behavior so that they can serve as reference groups to potential adopters. Such an approach would ensure the continued success of mobile-retail.

7. Limitations & future research

Notwithstanding the results presented in this research, there are some limitations that should be addressed. Notably, for the purpose of this study a choice was made to explore consumers' intentions to purchase via the smartphone, excluding other mobile-commerce devices (e.g. tablets). Further, the focus was on examining intention to purchase goods such as clothes, food and electronics, since these are most often purchased via the mobile channel in Sweden (Google, 2013[2]) and thus posed the least barriers. Due to the sampling limitation within a selected country (Sweden) and in a specific mobile-commerce context (mobile-retail), the findings should be interpreted with caution. However, it would be fruitful to test whether the structural model presented here holds in other contexts as well as other countries to examine if, for instance, cultural differences in regards to mobile-retail use exist. Furthermore, given that only positive relationships were tested in the proposed model, continuative research could build upon it with other constructs. Of special interest would be previously validated negative predictors of mobile-commerce acceptance, for example, perceived risk, transaction costs, lack of privacy, and security issues (Pagani, 2004; Wu & Wang, 2005; Khalifa & Shen, 2008; Yang et al., 2015) since these are identified as impediments to mobile-retail use (Google, 2013[1]). Future research could also expand upon the current findings by testing the proposed model across different samples. It may be the case that, for instance, other age groups exhibit different acceptance behavior in regards to mobile-retail usage. Moreover, the role played by individual characteristics such as technology experience (novice versus expert) or technological anxiety could be examined. In doing so, an attempt to segment different categories of mobile-retail consumers could be undertaken. A final limitation pertained in this study is that intentions were examined. It is recommended that future research investigate the actual behavior of mobile-retail users.

Appendix A. List of items by construct.

Perceived usefulness (PU)

PU1: Using a smartphone for purchases would enable me to shop easier.

PU2: Using a smartphone for purchases would enable me to shop faster.

PU3: Using a smartphone for purchases would make my shopping more productive.

PU4: Using a smartphone for purchases would make my shopping more effective.

Perceived ease of use (PEOU)

***PEOU1:** It would be easy for me to purchase via a smartphone.

PEOU2: It would be easy for me to learn to use the smartphone for purchases.

PEOU3: It would be easy for me to become skillful at using the smartphone for purchases.

PEOU4: Making a purchase via the smartphone would be clear and understandable.

Mobility (M)

M1: Purchasing via the smartphone is independent of time.

M2: Purchasing via the smartphone is independent of place.

***M3:** Purchasing via the smartphone is convenient because my smartphone is usually with me.

Compatibility (C)

C1: Using a smartphone for purchases fits well with my other use of the smartphone.

C2: Using a smartphone for purchases fits with my lifestyle and habits.

C3: Using a smartphone for purchases is a suitable method for shopping.

Social Influences (SI)

SI1: My colleagues think that I should use my smartphone for purchases.

SI2: My friends think that I should use my smartphone for purchases.

SI3: My classmates think that I should use my smartphone for purchases.

Intention (INT)

INT1: I plan to use the smartphone for purchases in the near future.

INT2: I intend to use the smartphone for purchases in the near future.

INT3: I predict that I will conduct purchases via a smartphone in the near future.

Note: *Item dropped after the exploratory factor analysis (EFA).

Appendix B.

Assessment of the discriminant validity.

Constructs	Compatibility	Usefulness	Ease of use	Mobility	Social influences	Intention
Compatibility	0.70					
Usefulness	0.31	0.66				
Ease of use	0.21	0.48	0.63			
Mobility	0.16	0.23	0.23	0.73		
Social influences	0.12	0.08	0.01	0.02	0.91	
Intention	0.46	0.29	0.13	0.08	0.11	0.87

Diagonals represent AVE for each construct; the other entries represent the shared variance (the squared correlations).

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