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CONSUMER ACCEPTANCE OF MOBILE PAYMENT SERVICES

AN EMPIRICAL STUDY OF FACTORS EXPLAINING SWEDISH CONSUMERS INTENTION TO USE MOBILE PAYMENT SERVICES

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Abstract

Mobile payment services (MPS) are relative new for Swedish consumers and are about to be more broadly introduced on the Swedish market. This papers objective is to understand consumers' acceptance towards MPS and their intention to use it. Based on previous surveys and theories, we developed five constructs into a research model were we measured consumer acceptance; Perceived Compatibility (PC), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Perceived Security (PS) and Subjective Norm (SN). In this paper we conclude that PC and PU are the main determents for consumers' acceptance of MPS. PS is supported and important more to older than younger generations. Our model did not find PEOU and SN significant in determining the consumers' acceptance of MPS. In the end, managerial recommendations are given.

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1. BACKGROUND

A commonly held view about payment systems is that they should enable people to exchange goods and services, be able to measure the value of different goods and act as an instrument preserving its value. In discussing the future of payment systems Niklas Arvidsson, Senior Researcher at KTH, comes to the conclusion in his report regarding the Swedish payment system that cash management is very costly. By moving toward digital payment systems we would significantly lessen the socioeconomic cost of upholding the payment structure of today (Arvidsson, 2009). Using calculations from Arvidsson, he goes so far as to say that a move towards a cashless society would decrease the costs by 1% of the gross domestic product (GDP) of a given country (Flaatraker & Robnsson, 1995; Humphrey, Willeson, Bergendahl, & Lindblom, 2006). The different payment solutions that can be administered with mobile phones are emerging alternatives to the cash regime. They go under the common name Mobile Payment Services (MPS).

One common definition of MPS is the one given by Gartner Group, a world leading company of information technology. They define MPS as: "Paying for a product or service using mobile technology including Near Field Communication (NFC), Short Message Service (SMS), Wireless Application Protocol (WAP) or direct mobile billing" (Gartner Group, 2009).

A few examples of these MPS are:

- Tickets for events, trains or cinemas
- Banking services
- Games, dating and communities
- Point of sale purchases in normal stores. A good illustration of this is ICA, the biggest chain of supermarkets in Sweden that has just implemented NFC technology in all its point of sales terminals. (PayEx, 2011)

In countries where the existing payment regimes do not work very well we have seen a recent surge in the use of MPS. At the same time we are seeing an increase in the use of mobile phones worldwide coupled with a rapid development in the mobile payment technology (Little, 2011; Taga & Oswald, 2009).

1.1 GLOBAL DEVELOPMENT

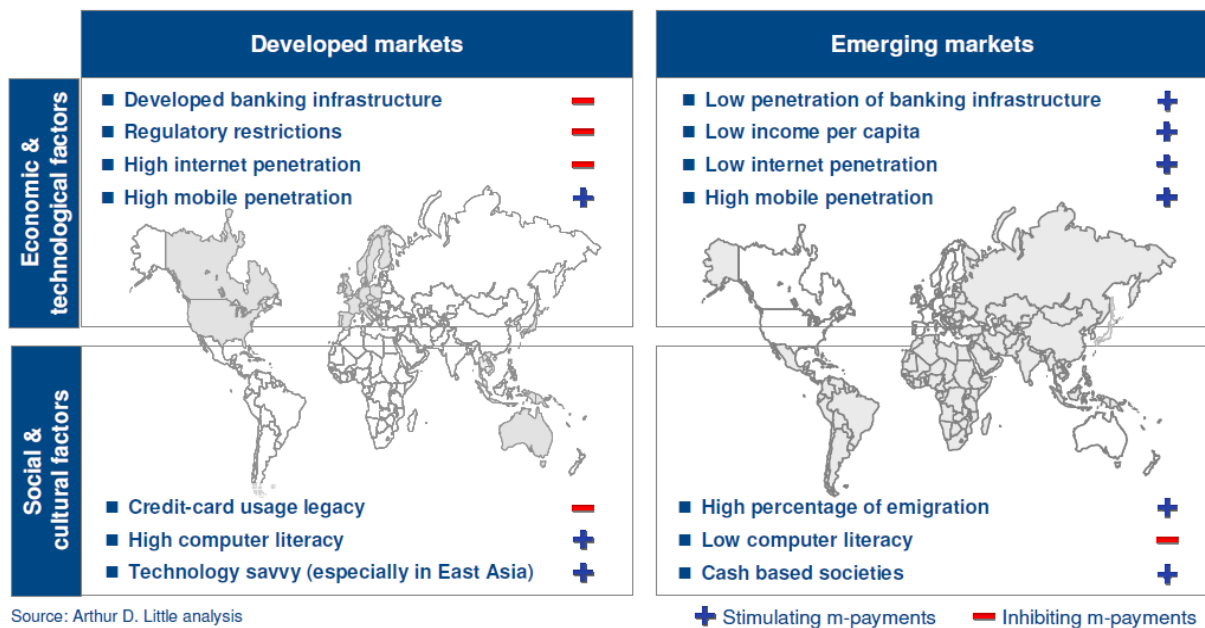


Fig 1. A model explaining the differences in MPS between developed and emerging markets (Little, 2011)

Figure 1 shows the different factors working for and against adoption of MPS for emerging and developed markets. In the report it is taken from we find that in emerged markets the change towards MPS is more important. This is because it allows them to use financial services in a more efficient way. It improves the standards of living in these countries and contributes to giving them an opportunity to a better life. In developed markets MPS is more of an extension of the existing payment infrastructure and allows people to deal with their financial needs “on the go” and in a timely fashion (Gartner Group, 2009).

A relevant example described in Global M-payment report by Little, Taga and Oswald (2011; 2009) of one of the different factors determining the rate of adoption of MPS is how well the current payment system works in a given country: In Kenya MPS was first launched in 2007 through their mobile operators (Little, 2011). After only 12 months the mobile payment project “M-pesa” had already more than 2 million users. M-pesa registered more than 11,000 new users per day between its launch in September 2007 and July 2009. The report continues its analysis by saying that this was possible because many of the inhabitants in Kenya did not have bank accounts. M-pesa provided new possibilities for people in Kenya to stay updated on international or national index prices. The success on M-pesa is due to the fact that the infrastructure for existing banking and alternative payment systems is absent (Little, 2011; Taga & Oswald, 2009).

The same report has more examples than Kenya and the overall conclusion is that there are big differences between developing and developed markets in the rate of adoption of MPS (Little, 2011). Another study that talks about this difference underlines the characteristics by saying that emerging markets are a fertile ground for the development of m-payment solutions due to their limited banking infrastructure and growing mobile penetration (Taga & Oswald, 2009). The study points out that

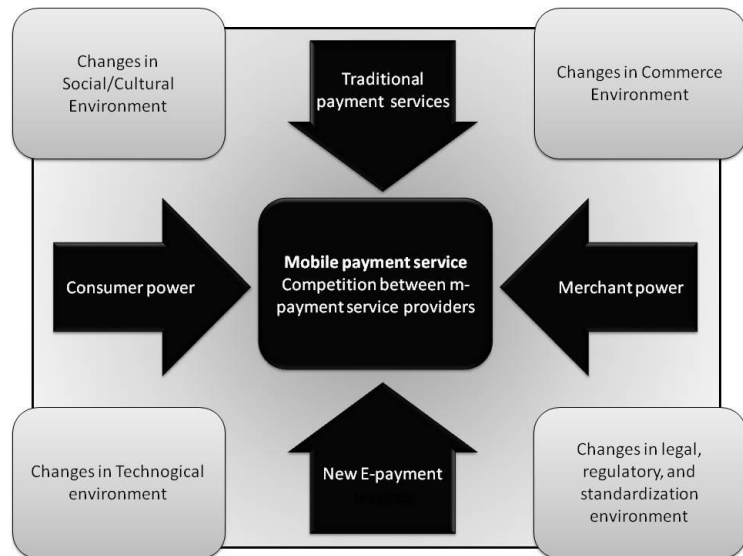


Fig 2 – Different factors affecting the adoption of MPS– T. Dahlberg et al.

the development of individual markets in both developed and emerging countries is influenced by economic, technological, social and cultural factors. This is further developed by Dahlberg in a model where he tries to explain most of the factors influencing the introduction of MPS (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). As can be seen in figure 2, apart from the contingency factors taken up by Taga & Oswald, Dahlberg et al., (2008) emphasis is put on the four market factors: Traditional payment services, new e-payment solutions, consumer power and merchant power. All of these together with the actual providers of the MPS will determine the rate of adoption of MPS.

1.2 DEVELOPMENT IN SWEDEN

In Sweden the development is toward a change in the payment regime as the use of actual cash has gone down from 9.6% to 2.9% of the Swedish GDP. In a speech, Lars Nyberg, the Deputy Governor of the Swedish National Bank describes this issue (Conference Card&Payment Forum, 2011 3rd of May; Nyberg, 2011). He chooses to see this and future development as an indication that the current credit- and bankcard system functions very well. He furthermore states that this system will continue to increase in terms of number of users. A report from Cash Butler, a Swedish e-payment company, also gives a somewhat negative picture of the future development of MPS. It indicates that Sweden is lagging in adopting MPS compared to some other developed countries such as South Korea and Norway. They point out that this is mainly because the parties involved, portrayed in figure 2, have problems finding a business model that gives all the necessary actors their part of the generated revenues. An interesting example of this is that in Sweden the mobile banking part of MPS is run by the traditional banks. This has caused the launch of mobile banking services to take longer than in other countries, which obviously has led to a slower

adoption. In the example of Japan, the mobile operators have instead created their own banking entities to run these operations (Cash Butler AB, 2009). The Payment Services Directive (PSD) developed by the European Commission is also helping with guidelines on how the banks and regulators in Sweden are supposed to form the new standards (Cash Butler AB, 2009). Countries such as Japan, Austria, Singapore and South Korea have the most developed usage of m-payments and m-banking while Sweden is in a developing stage (Little, 2011).

2. PROBLEM FORMULATION

In this section we will present our problem formulation, objective, limitations and definitions of some key concepts.

As we have seen, MPS are developing quickly and becoming viable payment methods in Sweden. In our literature review we found figure 2 from Dahlberg et al (2008). In the conclusion of their paper they stated that “to improve the quality and relevance of mobile payment research, we [...] recommend that researchers collect more empirical data backed by guiding theories [...]. Yet, we believe that more theory based empirical research is needed to enhance the current understanding of the mobile payment service markets”.

We also consulted Arvidsson (2009) through email correspondence. He pointed out that there are two areas where further studies are needed;

- Consumer attitude towards MPS
- Merchants' role in a future business landscape for MPS

The focus on consumer attitude towards MPS seems warranted. Existing studies in other cultural contexts also point towards local studies of the consumer attitudes (Schierz, Schilke, & Wirtz, 2010).

2.1 OBJECTIVE AND RESEARCH QUESTION

MPS will be introduced in Sweden in a near future (Little, 2011). How and when this will happen depends on a lot of different factors. The crucial point for the marketer and designer of these services is to know what the determining factors for the consumer to accept and adopt them really are (Arvidsson, 2009). This leads us to our research question:

- What are the main determinants for the consumer to accept and adopt mobile payment services in Sweden?

2.2 LIMITATIONS

We have identified two major limitations in carrying out this study. First of all, the sources on which we based our research model all used structural equation modeling (SEM), which is something we do not have enough time to learn to adopt properly. In a model based on SEM one is able to measure the independent constructs whereas we will only look at their relationship to intention to use. Secondly there was not enough time to do any pre-survey, which is why we virtually almost duplicated an existing research model (Schierz, et al., 2010) that was based on SEM.

2.3 DEFINITIONS

A few terms need to be further defined:

Mobile payment services (MPS) referred to in the background is rather ostensive without a very clear conceptual reach, which is why there is a need to add a few considerations in this report. Following the discussion around earlier studies done in (Schierz, et al., 2010), they concluded that most definitions included a mobile device. They defined it in broad terms as any payment for goods, services and bills authorized, initiated, or realized with a mobile device. When introducing MPS into our theory we will also use this broad definition.

There are many different definitions of what an attitude is and it is a very complex term and we will use it somewhat similarly to how Everett M. Rogers portrays it. For him, it is a relatively enduring evaluation of a concept (Everett M. Rogers & Mahler, 1999, p. 174). The report aims to put emphasis on the subjective nature of an attitude. This makes it very hard to measure.

NFC stands for Near Field Communication, and is a general name for wireless communication which is used at a distance of 10 cm or less. For example, when using your mobile phone you move the telephone near to a terminal which quickly easily transfers information and performs the purchase. An advantage with this technology is that is very hard to illegally read the transferred information from a distance.

Mobile banking means a financial transaction conducted by logging on to a bank's website using a cell phone, such as viewing account balances, making transfers between accounts, or paying bills. It is a term used for performing balance checks, account transactions, payments etc. via a mobile device such as a mobile phone. At presents Mobile banking is most often performed via SMS or the Mobile Internet but can also use special programs called clients downloaded to the mobile device.

3. THEORETICAL FRAMEWORK

“Men are generally incredulous, never really trusting new things unless they have tested them by experience” (Machiavelli 1513:51 cited in Rogers 1983:271)

In this section we will look at different research models previously used to measure the acceptance of new technology. As will be discussed, the theories are based on the assumption that an intention to use a new technology will result in actual behavior. Apart from the theories explicitly talking about this relationship we will look at theories that try to capture what consumer attitudes make up the intention to use and/or attitude towards using a new technology. This will be followed by a section showing how earlier theories on the adoption of technology have been used to predict the consumer acceptance of MPS.

3.1 THEORY OF REASONED ACTION (TRA) / THEORY OF PLANNED BEHAVIOR (TPB)

The Theory of Reasoned Action (TRA) lays the foundation for the discussion around how the relationship between the attitude and intention to use a specific product or technology could be a predictor of its future adoption. The TRA formulated by Ajzen (1975) starts by examining the meaning of attitude, ways of measuring it and its role in predicting human behavior. The basic functions of the model can be portrayed in figure 3, where there are four main constructs. The attitudes are central in that it is how one perceives and evaluate certain concepts and the objects or behaviors they refer to. The construct of Subjective Norm (SN) is a measurement of your personal values that by definition provides the motivation for future behavior. As can be seen in the model these determine the intention to act in a certain way in a given situation. This intention will then predict whether a person will perform a certain behavior or not.

The theory is very influential and has been used as a base for many further developments (Venkatesh, Morris, Davis, & Davis, 2003). One of the developments by the same authors was the Theory of Planned Behavior (TPB) where the construct of perceived behavioral control was introduced (Ajzen, 1991). The perceived behavioral control is the difficulty of taking a certain action filtered through the belief system of the potential user. One of the implications of the theory around this construct would be that; if the consumers do not perceive themselves as being in control they will not perform the tested behavior.

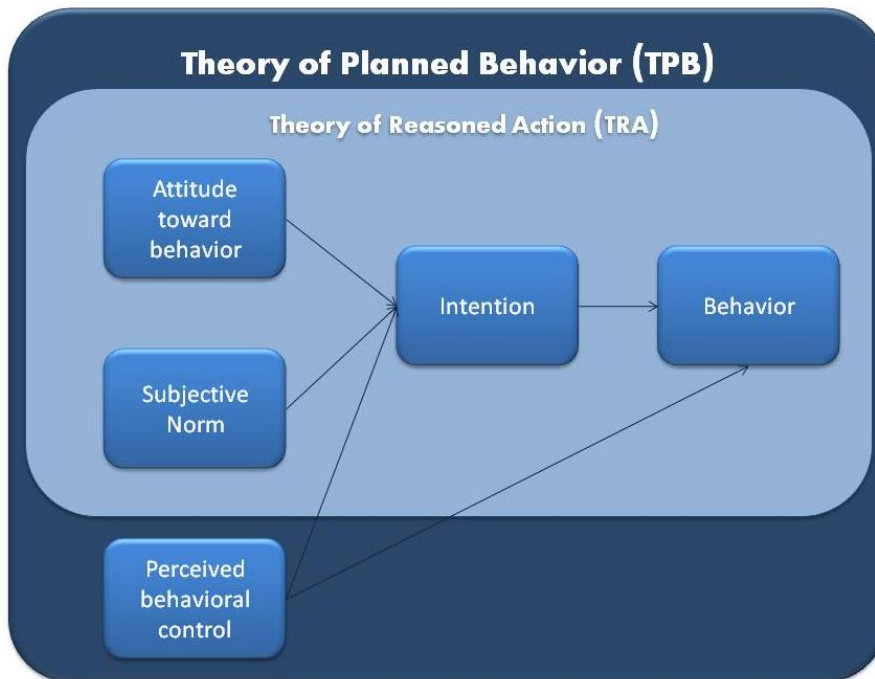


Fig 3 - Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior* :

3.2 TECHNOLOGY ACCEPTANCE MODEL (TAM)

Building on TPB and TPA, the TAM is one of the most frequently used models formulated as an information systems theory that models how users come to accept and use a technology. In looking at the acceptance of technology (Davis, Bagozzi, & Warshaw, 1989) choose the two attitudes they labeled most important for accepting a technology namely Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

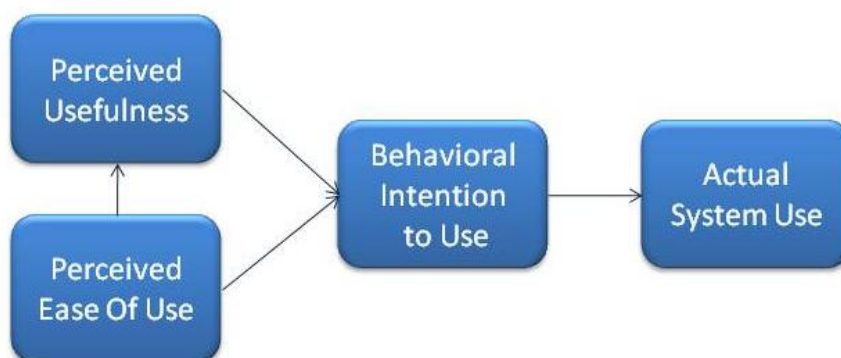


Fig 4 -Technology Acceptance Model (TAM) Davis et al., (1989) Venkatesh et al., (2003)

PU explains how useful the consumer finds a new technology whereas PEOU indicates how easy he/she finds it. The perceived element of the words is simply recognizing the facts that

the actual usefulness or ease of use is a subjective element and in asking consumers we can only know how they perceive something filtered through their epistemic perception of reality. In some ways this is similar to the perceived behavior control in assessing subjective attitudes though it lacks the analysis of the subjects. In other words fears and other emotions or feelings limiting the perception of how the consumer will interact with reality are not taken into account as much.

As can be seen in figure 4 they still follow the assumptions of the TRA in saying that our behavioral intention to use is a direct predictor of our actual behavior. Whereas the original TAM only includes these two constructs, the extended TAM2 model has kept the SN construct from the TRA (Venkatesh, et al., 2003).

3.3 ROGERS – INNOVATION ADOPTION CURVE

Together with TAM (and indirectly TRA/TPB) the Innovation Diffusion of Technology (IDT) model is one of the most frequently used models (Venkatesh, et al., 2003). The book introducing the framework by Everett M. Rogers is now on its 5th edition after first being published back in 1962. The main idea of the theory is that until we have tested a new invention it is very hard to assess how good it is. He talks about the process by which these innovations are communicated through certain channels over time. The very famous figure (fig.5) using the statistical concept of normal distribution provides an easily understood framework classifying the consumers into different categories depending on when in this process they are predicted to adopt the new technology. He defines the categories in the model as:

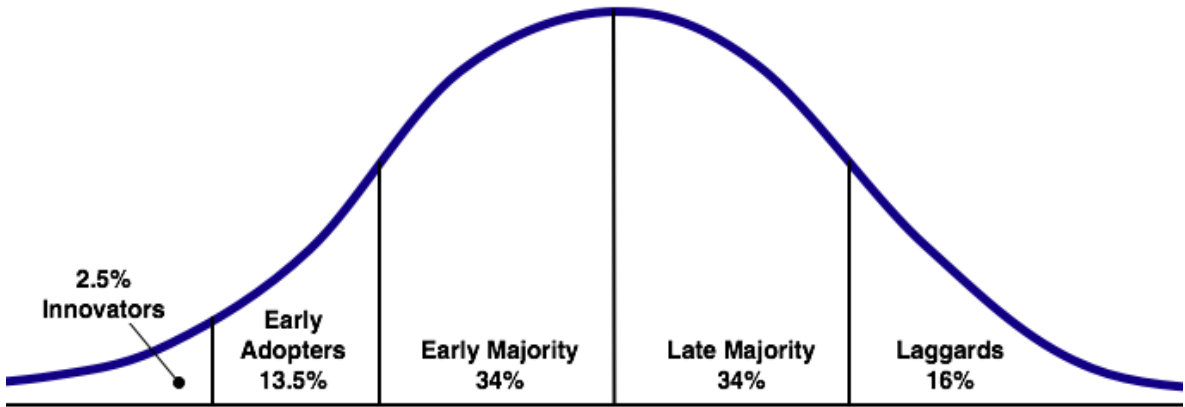


Fig 5 – Innovation adoption curve (Rogers, E. M. (2003). Diffusion of innovations (5th ed. p. 281). New York, NY

- **The innovators:** The persons that try out and adopt new technology as soon it is possible. They have technology as a central interest but they make up only approximately 2.5 percent of the adopter population.
- **The early adopters:** They are open for new innovations and blend this interest with professional problems and tasks. They make up approximately 34 percent.
- **The early majority:** They are focusing on the real professional problem and not the tools that might be used to solve the problem, but they are relatively open for new technology and make up approximately 34 percent, which is the first half of the mainstream.
- **The late majority:** They share the same opinion as the early majority but are less interested in technology and more skeptical toward new technology. They make up approximately 34 percent, which is the latter half of the mainstream.
- **The laggards:** This is the last 16 percent of the potential adopter population and is the most likely to never adopt the new technology at all.

This model has been the base for many studies that compares and classifies consumers with different background factors and attitudes weighing differently depending on the context. Of central concern is that the compatibility of the new innovation with one's lifestyle should be a very important predictor of how willing a certain group of consumers is to adopt a new innovation.

Furthermore, Rogers discusses the *critical mass theory* which he defines: "The critical mass occurs at the point at which enough individuals in a system have adopted an innovation so that the innovation's further rate of adoption becomes self-sustaining". As more and more individuals in a system adopt, the non-interactive innovation is perceived as increasingly beneficial to future adopters. When critical mass is reached and later adopters adopt the system, it confirms to early adopters that they have made the right choice (Everett M. Rogers & Mahler, 1999).

3.4 EARLIER STUDIES ON ACCEPTANCE OF MPS

This report aims to go into details in four different models that have all been predicting the intention to use MPS. All of them are based on the different general theories we have described. Of these the TAM is the most frequently used model. In what is probably the most cited paper in the area (Venkatesh, et al., 2003) the authors argued for simplifying the model by removing the attitude construct. In adopting this, Chen (2008) instead let PU and PEOU be directly determining intention to use. He also chose to include perceived

compatibility from IDT and a last factor called perceived risk. In his study, he got 299 positive answers, which confirmed that all these factors did predict intention to use with perceived compatibility as the most important of the different factors. In a study by Schiertz et al (2010) they did not remove the attitude construct but included all the factors Chen (2008) took up in one way or another while adding the SN and mobility constructs. The model was also confirmed in a study with 1447 usable responses where perceived compatibility again was seen as the greatest predictor of intention to use. The two underlying papers have both taken up security in one form or another and confirmed that the perceived security (PS) does have an effect on intention to use MPS.

Another paper (Nysveen, Pedersen, & Thorbjørnsen, 2005) looked at mobile services in general and also tested the PU and PEOU constructs from TAM. Both the factors were considered to be important. Additionally they included the normative pressure and behavioral control constructs that also proved to be important factors in adopting mobile services.

Whereas Schiertz et al (2010) and Chen (2008) used a sample of the potential users of MPS, Kim et al (2010) chose to compare people who had already used MPS in order to make a study of underlying demographics as well as different constructs based on TAM and IDT. The study did not find compatibility as the most important factor but rather came to the conclusion that PU and PEOU were the most significant factors. An interesting part of the result is that they identified that ease of use is important for the early adopter, while the late adopter values usefulness more. According to Kim early adopters are more confident and rely on their own mobile technology knowledge (MTK).

3.5 CREATING THE MODEL

Following earlier models in the field some constructs has shown greater effect on intention to use. The theories of TAM and IDT both seems like a good ground for measuring how consumers will adopt MPS. The SN construct taken originally from TRA but developed in TPB together with the more case-specific security aspect taken up in both Schiertz et al (2010) and Chen (2008) has also proven to be important factors according to earlier research. A demographic factor that could have been proved significant in the past is the age of the consumer. Hence the final research model will be based on PC, PU, PEOU, PC and SN while extensively tested for differences attitudes and behaviors depending on the age of the respondent.

4. THE RESEARCH MODEL

In this section we will discuss our theoretical model. After a brief background discussion we will present our hypotheses. We will do this by relating them to the different constructs that make up our model.

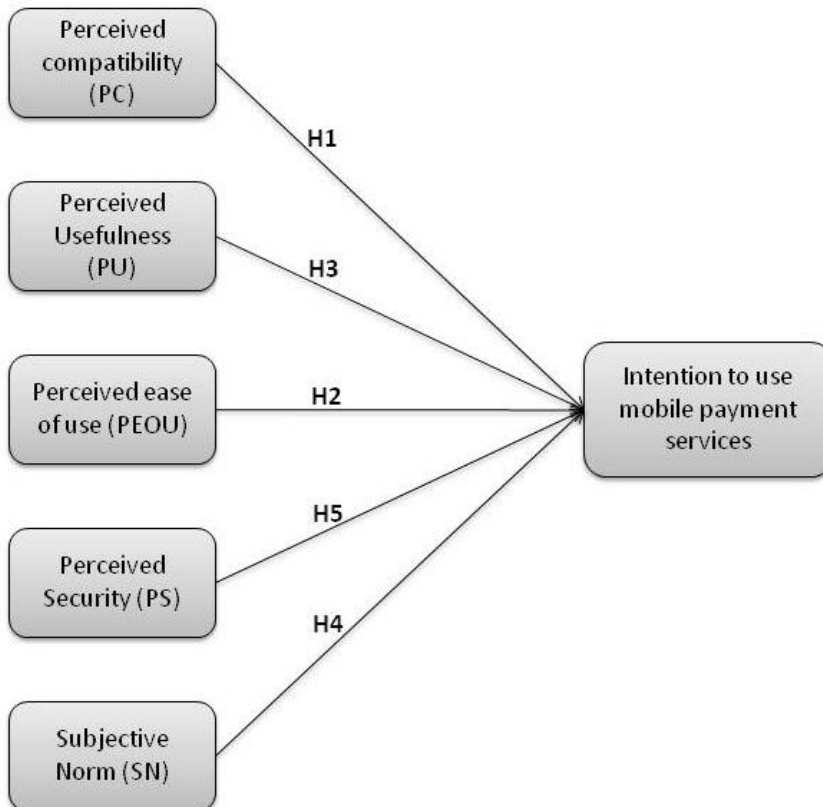


Fig. 6 our research model: Measuring the acceptance towards MPS through the factors influencing the intention to use MPS.

Normally, when models like this are applied, a pre-survey test is run. Here one would take the result and use factoring to sort them into factors that then can be used to create the constructs. With our limited resources, we instead chose to take almost the same items as Schiertz et al (2010) and sort them into the same constructs they did. The constructs discussing in the paper can be seen in fig. 6. We also want to point out that we changed a few items with reference to other research. The different measurement items can be seen in the appendix.

After getting values for each constructs they will be run through a multiple regression analysis to see how they affect the intention to use MPS. The background variables will be controlled for by being included in this regression. The higher the explanatory value (β) the more does a change in a given variable produce a change in the intention to use MPS. The model works under the assumption that this causality exists. Since the amount of time is it

not possible to check for this causality as it would require us to do a study over time preferably with the same subjects. Earlier studies have checked for this (Venkatesh, et al., 2003) and we feel assured that enough causality exists for the model to be determining future behavior.

4.1 INTENTION TO USE (INT)

By constructing our model without using the SEM, we are implying the implication that we can only measure the direct influence of each of the five factors interpreted through five constructs on intention to use. Both (Chen, 2008) and (Venkatesh, et al., 2003) argued that the attitude construct was hard to measure. In the end they did not include it in their proposed research models. This gives us a very good basis for measuring the impact of the five constructs directly on the intention to use without adding a construct measuring the attitude towards MPS. The intention to use was measured by simply asking if the respondents would use MPS if it was available.

4.2 PERCEIVED COMPATIBILITY (PC)

The popularity and effectiveness of the IDT model would make this a very good base for our research model. The work of Kim et al., (2010) was able to draw very interesting conclusions by comparing consumers in the categories developed by in the IDT . In order to make this work he did however only compare respondents who had used MPS. Due to a low penetration of mobile payment services such as point of sale payments and mobile banking, we would have had a hard time getting hold of and categorizing proper respondents in order to copy the model of Kim.

The solution adopted by Chen (2008) and Schiertz et al., (2010) was to put out questions to the respondents on how well MPS fit with their lifestyles as well as comparing it to existing alternatives. The answers to these questions were put together in the construct perceived compatibility, which measures the perception of the consumers on how well new technology fits with their current lifestyle. As mentioned, both of these studies together with a study by Mallat et al (2009) measuring the intention to use mobile ticketing services found the construct to be the most significant predictor of the intention to use MPS (Mallat, et al., 2009). This has led us to include a similar construct to answer the hypothesis:

(H1) There is a positive relationship between the perceived compatibility of MPS and the intention to use MPS.

4.3 PERCEIVED EASE OF USE (PEOU)

We have mentioned how the two original constructs of PEOU and PU have been used and proven significant in all of the theories applied to MPS we studied. We see this as a strong reason for including them in our model. The PEOU has been measured in similar ways in the different sources, and with these as a base we chose to ask the consumer if they perceived MPS as easy to understand and use as well as if they perceived it to be easy to become skillful in using them. The underlying assumptions in these questions are that if it is perceived hard to use or learn to use the services, it would be a great barrier to actually trying them. Given the results in the study by Kim et al (2010), this will also give rise to a useful comparison between the different age groups. The hypothesis explored in our model will thus be:

(H2) There is a positive relationship between the perceived ease of use of mobile payment services and the intention to use mobile payment services.

4.4 PERCEIVED USEFULNESS (PU)

Most of the things said about PEOU are also true for PU. The big difference is that there are many diverse aspects of it that the different models take into consideration. In the end, we asked the consumers if they perceived MPS useful but also added items asking if they perceived it to be beneficial and if it was perceived as faster than the existing payment methods. The question about whether it is perceived as faster can be found in the literature around TAM and is taken up in most of the MPS specific literature (Nysveen, et al., 2005). It is important since perceived advantages indicate that people see it as more useful than other options; this would provide a good case for trying or using the given service. The arguments for it being beneficial are similar where something one would find beneficial in most occasions could also be perceived as useful. All of them can be related to the hypothesis:

(H3) There is a positive relationship between the perceived usefulness of mobile payment services and the intention to use mobile payment services.

4.5 SUBJECTIVE NORM (SN)

The argument for SN first formulated in TRA is that the opinions of our surroundings and their impact on us are very important when we decide to take a certain action. In the context of MPS it has been argued (Nysveen, et al., 2005; Schierz, et al., 2010) that since these services are so new so few have their own experience of them, the opinions of others are going to be especially important. This led us to ask whether people that are important to the respondent would find using MPS a good idea and whether they would recommend that the respondent use them. Simply put “the social context of the consumer should not be neglected” (Schierz, et al., 2010) which is why we formulated the hypothesis saying that:

- (H4)** There is a positive relationship between the subjective norm of mobile payment services and the intention to use mobile payment services.

4.6 PERCEIVED SECURITY (PS)

The only object not explicitly part of any of the more extensive theories on acceptance of technology is the perceived security (PS). It has however been taken up and proven to be significant to the intention to use MPS by Chen (2008), Nysveen, et al (2005) and Schiertz et al (2010). The reason is that in using a mobile phone as a platform the consumers are unsure about the security aspects concerning this. This leads to them not being sure it will be safe and this should have a negative impact on their intention to use the service.

In explaining a similar phenomenon Nysveen, et al., (2005) use the behavioral control construct from TPB in their study. Their conclusion after confirming the construct is that if consumers are afraid of doing wrong, e.g. not perceiving that they are in control, they will use another method. This is according to Schiertz et al (2010) and Link (2006) the perceived risk of using MPS since it is abstract and the consumer is not in control of the payment process.

We chose to measure in what way the consumers perceive how secure the systems are by asking how secure the consumers think they are, how they perceive the risk of abuse of their confidential information and what their concerns about whether a third party could oversee the transaction. Here these aspects of security are all used by earlier theories (Nysveen, et al., 2005; Schierz, et al., 2010). The aspects were also mentioned in the interview with payex and in other background theories (PayEx, 2011). The hypothesis we will test is:

- (H5)** There is a positive relationship between the perceived security concerns of mobile payment services and the intention to use mobile payment services.

4.7 AGE DIFFERENCES IN ADOPTION AND ACCEPTANCE OF MPS

Several of the sources in our background (Little, 2011; PayEx, 2011; Taga & Oswald, 2009) and theoretical studies (Kim, et al., 2010; Kumar & Lim, 2008) have indicated that there is a difference in the perception of MPS depending on the age of the consumer. It is indicated that this will be important in how designers and marketers of MPS target different segments of the market. Theories say that younger people are more likely to use MPS than older generations due to their knowledge of technology (Kim, et al., 2010; E. M. Rogers, 2001). This also reflects in more positive attitudes towards MPS. The last hypothesis will be tested by checking the model for differences between older and younger consumers. It is:

(H6) The perception of MPS differs between the two groups <35 and >34.

5. METHODOLOGY

The purpose of this chapter is to explain our planning process and research method, and to clarify the choices that we have made. Additionally, we will have an initial discussion about the validity and reliability of our collected data.

In order to get an understanding and investigate Swedish consumer attitude we did a thorough literature review of what has already been done in the area. We prioritized investigating how the current actors look at the MPS market rather than taking our time to carry out one or more pre-survey tests on our proposed research model. Unless otherwise stated we use Hair, Anderson, Tatham & Black (1998) and Holme & Solvang (1996) to justify our methodological decisions.



Figur 7 – Method

5.1 RESEARCH MODEL

Our literature review found many surveys on acceptance of new technology but only a few on MPS. Of these none was done in the Swedish context. Our research model is based on these studies but tested in the Swedish context. We tested it empirically through a web-based survey.

To test this model we used a deductive method where several hypotheses were tested against our collected data.

5.2 TARGET POPULATION

The *population* we wanted to target in this study comprises all persons in Sweden who are or soon will be able to use mobile applications. Based on information from existing theories and our two interviews, we came to the conclusion that the target population for MPS was between the ages of 18 and 35 since they are more acquainted with mobile technology (Bank X, 2011; PayEx, 2011). We distributed the survey to 1295 friends most of whom were <35 on Facebook and over one hundred e-mails targeted at an older population through our parents and Uddevalla Kommun, a Swedish municipal. The goal was to get a group

representing our target population, but also to have two big enough groups to test if our hypothesis that there is a difference between the two age-groups can be verified.

5.3 THE INITIAL INTERVIEWS

The first interview was with Fredrik Lindblom and Rikard Wallin at PayEx. PayEx describe themselves as the foremost experts in Nordic payment solutions. They are currently one of two big providers of MPS solutions in Sweden. Two years ago they launched the first Swedish mobile payment system. In this interview we were told how the market looks today and what mobile payment solutions are currently available. They also recommended us that we contact one of the bigger Swedish banks to get a broader view of the situation. We then got in contact with a bank that, when we contacted, stated that it wished to stay anonymous during the interview we executed. In this second interview, we examined the provider's attitude to the end consumers.

5.4 CONSTRUCTING THE SURVEYS

Guided by previous theories and our interviews, we focused on five constructs. They were Perceived Usefulness (PU), Perceived Compatibility (PC), Perceived Ease Of Use (PEOU), Subjective Norm (SN) and Perceived Security (PS). These constructs included 2-4 questions each, giving the survey a total of 21 questions. These different measurement items were formulated in a Likert-scale where our respondents were able to give answers on a five-point balanced scale from 1 (does not approve) to 5 (fully approve) (Trost, 2007). Given discussions and arguments in (Holme & Solvang, 1996), we decided not to include the option "do not know". We did this in order to measure their perception of each statement and minimize the loss of respondents.

5.5 DATA COLLECTION

Although presented online, the survey was designed in a standardized way where every respondent was given the same information. The layout of the questionnaire was the same as the order in which the questions were presented. We reduced the questionnaire to a total of 17 questions and 4 demographical questions to reduce the potential loss of respondents. Doing this should have given us a higher frequency than a more extensive questionnaire. The survey was sent between the 26th of April till 29th of April 2011 and during this time we collected 320 completed answers. In order to collect the answers we motivated the respondents by offering them a chance to win cinema tickets. In the end, we reached a response rate at 22.8 %. We see this as a good result since the result rate from surveys done on the internet normally give lower frequencies of answers than traditional surveys (Shin, 2010).

5.6 VALIDITY/RELIABILITY

In order to ensure whether our results were reliable we need to consider if the measurements are consistent and if we know exactly what we are studying. This is controlled by validity and reliability where validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. Reliability is concerned with the accuracy of the actual measuring instrument or procedure (Holme & Solvang, 1996). We choose to adopt constructs and items frequently used in previous studies, e.g. Shiertz (2010). They completed two rounds of factor analysis excluding construct interference due to Kaiser-Meyer-Olkin. In the end, their Cronbach alpha test with an overall measurement over 0.7 showed sound support for their model (Hair, et al., 1998).

Given the proven validity of their reports, ours should also be valid. As mentioned, as we chose not to do a pre-survey test and wanted to keep the survey short we only included 4 demographic questions. This implied that identifying different biases in the data was difficult and could not be checked for by recollecting the data. We checked the measurement items so that the internal correlation of the constructs was high and the external correlations between them were low. In the end we had to exclude four items in order to minimize high external correlations between the constructs. In the end we used Cronbach's alpha in order to assess the internal consistency of the construct measurement (Hair, et al., 1998) suggested that the score for each construct in an exploratory survey should be greater than 0.6 to be considered reliable. With a value of 0.66 our data was deemed reliable and found to be appropriate for further analysis.

6. EMPIRICAL FINDINGS

In this chapter we will start by presenting the demographics of our sample data followed by a very brief account of the mean values of the constructs. Following this we, will apply the data to our research model. The discussion and deeper analysis of the presented data will be combined in the discussion and analysis section. This is because the data applied to the model in itself does not provide much meaningful analysis but rather together with our interviews and background readings can be shown in a representing matter.

6.1 SAMPLE DEMOGRAPHICS

The sample is supposed to represent the potential MPS users in Sweden, which is why we have done comparisons between our demographical data and this target population in Table 1.

Division		Frequency	Percent (%)	Population of Sweden (%)
Gender	Men	131	40,9	50,85
	Women	189	59,1	49,15
	Total	320	100	100
Age	Under 18	8	2,5	23,20
	18-24	111	34,7	10,99
	25-34	93	29,1	14,28
	35-54	75	23,4	30,40
	55-64	28	8,8	14,15
	65-70	5	1,5	6,98
	Total	320	100	100,00%
Income	Under 150 000	131	40,9	
	150.000–250 000	37	11,6	
	250.000–350 000	66	20,6	
	350.000–500 000	53	16,6	
	500.000–750 000	24	7,5	
	750.000–1 000 000	8	2,5	
	Over 1 000 000	1	0,3	
	Total	320	100	
Finished or on-going education	Public School	7	2,2	
	High school	50	15,6	
	Post-secondary Edu.	27	8,4	
	Extension studies	7	2,2	
	University	229	71,6	
	Total	320	100	

Table 1 – Demographic variabls

Of the 320 completed answers there were 212 respondents 34 or younger and 108 35 or above. Although the older group is half the number, is it still big enough to make useful statistical analyses (Hair, et al., 1998). The greatest bias in our data can be found with regard to education, where an absolute majority of the respondents (71%) was either engaged in or had finished University studies. Compared to the rest of the respondents (29%), we found that the difference between them was not at all that big, though the intention to use was slightly lower. We got more female than male respondents but this factor did not seem to provide big differences in our results. When controlling for the demographic variables in the final model the result showed that income did have a positive effect on the intention to use. While this is interesting it falls outside the reach of our study and will not be further analyzed. The only chosen background variable that will be further analyzed is age. This is because limitations of time and resources.

6.2 ATTITUDES TOWARDS THE CONSTRUCTS

As explained in chapter three each construct is built upon 2-4 items measuring the different attitudes toward the construct. Table 3 in the appendix shows the mean values of the constructs used in the final model. The study showed many interesting results while comparing the means of the different questions and constructs. The comparison of means in the appendix has been used mainly to locate biases or problems with the data. As a brief analysis of just the mean values our study show that more people on average intend to use MPS given that it is available than those who will not. They generally perceive that it is easy to use and useful. PC is slightly positive whereas PS and SN are slightly negative.

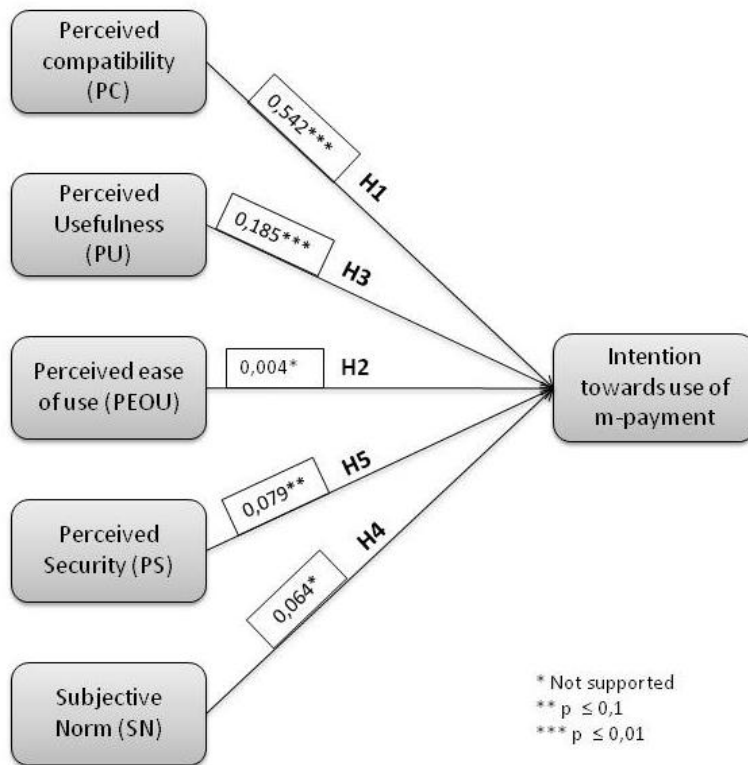


Fig. 8 – Research model with data applied

6.3 APPLYING OUR SURVEY DATA TO THE MODEL

We followed an approach to check our data for error that was proposed by (Hair, et al., 1998). After removing highly correlating constructs, we ran the multivariate regression analysis in SPSS using the different construct while controlling for our four background variables. The results presented in the model shows what constructs are determining the intention to use MPS for the consumer. H1, H3 and H5 are supported while H2 and H4 are not. This means that according to the model with the data applied PC, PU and PS are determining the intention to use MPS while SN and PEOU are not.

Our model proved a good fit with the data gathered. The adjusted R^2 of 0.593 implies that given our assumptions our model explains 59.3% of the variance in the data. After performing the Durbin-Watson test, our data showed a value of 2,017 which falls in between the critical values $1.5 < d < 2.5$. From this test we are able to assume that there is no first order linear auto-correlation in the data.

The F-test received a positive value ($F=52,708$) that proved highly significant. This enabled us to continue under the assumption that there is a linear relationship between the variables in our model. In the final model we did not find any collinearity (all variables have a tolerance of < 0.1 and a VIF < 10) either.

We found that the only background variable that was determining the intention to use MPS at a 95% significance level was income ($\beta = 0.171$). While this is an interesting finding, the bias in our survey makes it hard to draw any strong conclusions from this.

The significant constructs showed the same characteristics in the form of effect on intention to use as in earlier theories. Of the five constructs only PU and PC proved significant at a 99% level. PC had a much larger β ($=0.542$) than PU ($\beta=0.185$) indicating that this is the main predicting construct in our model. While the predictions on PEOU and SN had very low significance levels the PS construct showed a lower impact ($\beta=0.079$) at a lower significance ($p=0.067$) than PC and PU.

6.4 SEPARATING OLDER FROM YOUNGER CONSUMERS

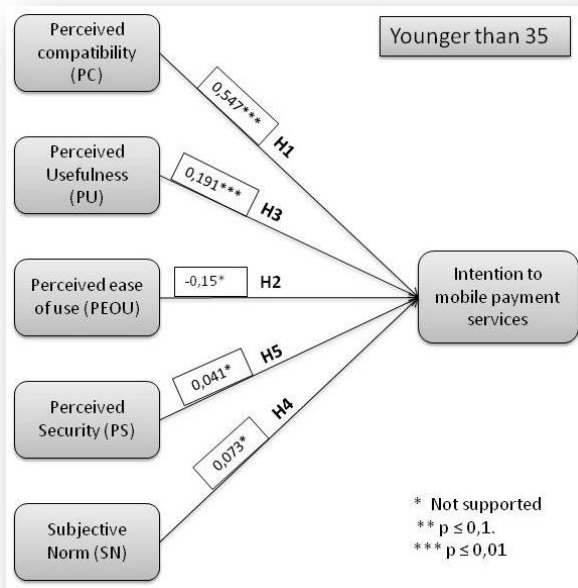


Fig. 9 Research model, age comparison

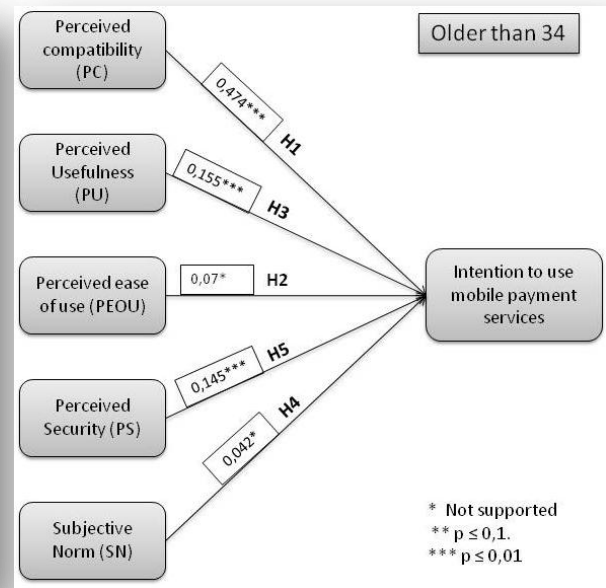


Fig. 10 Research model, age comparison

We have created two different models as shown in figures 9 and 10. As shown in the figures, the biggest difference is that PS is very important for the older consumer but not supported for the younger ones. This confirms H6 as none of the models shows proof of collinearity and has high F-values with a high significance confirming that there is a linear relationship between the independent and dependent variables. It is also important to note that both the models got a Cronbach's Alfa higher than 0.7 indicating that they have a high level of internal validity.

For those 34 and younger the model explains 60.7% of the variance ($R^2=0.607$) and only two of the constructs are supported, namely PC and PU. For those 35 and older the model explains 64% of the variance ($R^2=0.64$) and apart from PC and PU, the PS construct is supported as well. With a β of 0.145 at a high level of significance ($p < 0.01$), PS explains almost as much of the variance in the intention to use MPS as PU ($\beta=0.155$). For both the groups PC is by far the highest ($\beta=0.547$ for <34 and $\beta=0.474$ for $35<$).

As mentioned in the beginning of this chapter will we discuss and further analyze the result in the discussion chapter since the field is a rather complex field with many influencing variables.

7. DISCUSSION

This chapter aims to discuss the results of our data applied to our research model. This will be followed up by discussing the managerial impact of these results as well as the differences in age. To finish up, we will make recommendations for further research based on our results.

7.1 EVALUATING THE SHORTCOMINGS OF THE MODEL

So far we have concluded that after constructing a survey similar to earlier studies we also got similar results, proving the effectiveness of the research models. This also made a good contribution to the understanding of the consumer in a Swedish perspective. The difficulties in measuring attitudes make it very hard doing detailed comparisons between our study and earlier work. We will now have a brief discussion about why we got the results we did.

This study set out to test the determinants of the consumer acceptance of MPS. The model we developed based on earlier research in the area was tested using several hypotheses specifying the key drivers of the acceptance of MPS. Though similar to earlier studies, the model failed to give any significance to PEOU and SN. In the models based on Structural Equation Modeling much adopted by other authors PEOU was one of the determinants of PU. This means that a lot of the usefulness factor explained in our construct PU should be dependent on PEOU. We see this as a possible explanation for the fact that PEOU is not supported. In the questions underlying the SN construct a lot of people answered a three on a likert scale. We interpreted this as an indication that they did not have enough knowledge to answer the question. This could be a reason for SN not being supported. These possible reasons are dependent on faults in the theoretical models and the formulation of the questions. Because of this, we will not draw any conclusions on them not being found significant in our research model.

The items asking straightforwardly if MPS is useful and if it fits well with the respondents' lifestyles correlated too much with each other and could not be included in the final research model. This shows the overlapping features of the two constructs PC and PU. If one perceives MPS as useful one will perceive them as compatible with his/her lifestyle. As our model proves a positive attitude towards PC and PU, also imply that one in most cases will have an intention to use MPS as well. Although some studies (Nysveen, et al., 2005) decided against including PC in their model, we still found having both this construct and PU was useful. Our results now show that it is the compatibility with their lifestyle that is a stronger determinant of their intention to use MPS.

7.2 FURTHER EVALUATING THE SCIENTIFIC METHOD USED

We will now have a brief but deep discussion around how our choice of scientific method has affected our results.

First of all we ran the statistical tests on the internal and external validity of our constructs. The results showed that the study is statistically reliable. We have also confirmed many of the theses and results of earlier studies making our contribution in line with the general scientific community. This scientific community is thus the strong foundations on which we assess the reliability of our research. We interpret Thomas Kuhn's very influential book "*The Structure of Scientific Revolutions*" as discussing whether this ground is stable enough to secure reliability (Kuhn, 1962).

Kuhn argues that by being part of this scientific community we are automatically part of their paradigm. The paradigm in the scientific community is defined by the vocabulary, methods and questions used in assessing the results. The aspect of the reliability that is affected by theorizing around the paradigm is the part of the reliability that rests on all the assumptions innate to this paradigm. This is not something we can test or discuss without going outside our theoretical framework which would make the analysis meaningless.

The other issue we will raise here is how the shortcomings of our theory call the whole venture of naming it scientific to into question. We introduced hypotheses 2 and 4 into our research model and found no support in our analysis for the fact that they had any unique explanatory value. In checking them against previous theories we have clear evidence that they should have. Here we can draw the conclusion that it is our model that is lacking explanatory power rather than the constructs that are missing an explanatory value. The reasons given have shown the existing difficulties in measuring attitudes through our survey.

Based on the assumptions of the multivariate regression model (Hair, et al., 1998) we can conclude that given that we accept the model, something we have chosen to do, the conclusions already discussed should be valid. Given that we accept the paradigm from within which we are conducting our research, our applied model and analysis should be able to provide valid and reliable managerial impact. We can also make a meaningful contribution to the scientific community by recommending further research areas based on our results.

7.3 EVALUATING THE RESULTS BASED ON THE BACKGROUND INFORMATION

The two items measuring PC compared MPS to other ways of payment services such as cash or cards. Since MPS are new, the default option today is to pay with cash or card. In line with the theoretical background, consumers seem to need MPS first of all to be as compatible as other payment services to their lifestyles in order to be able to be adopt them (Kim, et al., 2010). To be able to fully adopt them, our results imply that they need to see a specific advantage in using MPS compared to existing methods. As the usage of mobile

phone services is increasing all the time the level of compatibility with the consumers' lifestyles will continue to rise. The strong correlation with PU should imply that as PC rises it will follow that MPS will become a more useful mode of payment.

The conclusion drawn from this is that from a consumer perspective, the demand for MPS will rise. Given the prerequisite that the other actors in fig. 2 will make MPS available for the consumers these services will become more frequent (Dahlberg, et al., 2008). This is in line with our background information indicating that 2011-2012 will be the time when MPS will become part of the mainstream payment solutions (Little, 2011; PayEx, 2011; Taga & Oswald, 2009). In the long run the acceptance of this technology on behalf of the consumers will rise which leaves the question of its future in Sweden to the banks and merchants finding a viable business model.

Previous studies came to the conclusion that the consumers' intention to use new technology is dependent on how safe they perceive it to be. By including the PS construct we could support this statement. The interesting finding in this is that the importance of PS is much lower than that of PC and PU. As exemplified in the background section the existing banks are very active in creating the MPS compared to other parts of the world where mobile operators are themselves acting as banks. This could make the consumers see the security aspect of mobile banking as granted by the banks. With the current card-services the banks often give out compensations when things go wrong. Hence the security aspect will not differ as much between the different forms of payment could have been imagined.

In testing the model for age we came to the conclusion that there were some differences between the different age groups. The most prominent difference was that PS was fully supported by the older generation but not by the younger generation. One way of explaining this could be the difference in mobile technology knowledge (MTK) between the two groups. The younger group was raised to use their mobile phone at a higher rate daily compared to the older generation. On this assumption, younger people are more acquainted with MTK and trust the MPS issued by their bank. Consequently, PS is not as important and probably therefore not supported for the younger respondents.

7.5 RECOMMENDATIONS FOR FURTHER RESEARCH

We will now give recommendations for further research. First of all, our entire model found the demographic variable income to be significant in predicting the intention to use MPS. Because of partly unreliable data due to the method adopted in formulating and distributing the survey we decided not to draw any conclusions based on it. We do however recommend future research to control for biases in the income variable and examine if there is a correlation between income and adoption of MPS.

The other limitation of our study was the broad definition of MPS. We therefore recommend further research to look at the sub disciplines in MPS and examine the acceptance separately. Of special interest in the near future is the consumers' attitude towards mobile banking, which is a key component in the concept of MPS.

8. CONCLUSION AND MANAGERIAL IMPACT

We will now share our main findings from a managerial point of view and make recommendations for actors on the MPS market. Following this we will give our final conclusion.

8.1 MANAGERIAL IMPACT

This study aims to examine the consumers' attitude towards MPS in a Swedish context. The result, as presented in the data section, tells us that there are three constructs that have a statistically significant effect on intention to use, namely PC, PU and PS. Summarized in the previous discussion the main conclusions we offer to marketers and companies reading this report are:

To capture the older generation of consumers our study, together with external sources of information, indicates that usefulness and security are the most important factors. Our results and interviews conclude that members of older generation think MPS are relative useful but they are a bit unsure how to use the service and whether it is for them to use (PayEx, 2011). Cash is a concrete mode of payment and the older consumers can clearly understand the whole payment process when using it. The older generation has in the last couple of years learned to use and rely on bankcards in a broader sense (VISA EUROPE, 2011) so the challenge for marketers is to explain what is happening during the mobile payment process. One such example discussed in other papers is that it could be faster than existing alternatives. As has been discussed, the older people are skeptical of the security aspect of MPS because of their lack of mobile knowledge (Kim, et al., 2010). These results contradict the intense focus other actors have on security (Arvidsson, 2009; Bank X, 2011).

For the younger generation, 18-34 there is a small difference. Seeing that the older generation must be convinced of MPS's usefulness and security issues, members of the younger generation have another perspective on mobile technology (Kim, et al., 2010; Little, 2011; E. M. Rogers, 2001). They have a more emotional relationship (Kumar & Lim, 2008) with their mobile phone. As we see it, marketers now have a possibility creating a new perception of consumer life-styles that includes MPS. The younger generation finds it easier to adopt MPS due to their mobile technology knowledge. They believe it to be useful. Marketers should create incentives by showing how it is possible to use the MPS in places the younger consumers see as "cool" or how MPS simply makes their current way of life easier. By doing this, they can create a "talk value" among the younger consumers and more quickly reach critical mass for a mainstream adoption of MPS.

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11 APPENDIX

11.1 INTERVIEW 1 – PAYEX (SUMMARY)

PayEx are the foremost experts in payments within the Nordic countries and launched two years ago the first Swedish m-payment system. PayEx explain MPS as a “Three-step-rocket” where you hear about the service, see how it is used, but it is not until you use the service yourself that you understand and adopt it. Fredrik Lindblom at PayEx believes that as soon as you reach the critical mass of consumers will MPS become mainstream, but it depends on the Swedish bank when they introduce a standardized solution for MPS.

Furthermore, Lindblom believe that a target population at 18-30 is the most efficient population since they are more acquainted with the technology and are more open to use it in their everyday life. The benefits of MPS compared to bankcards are, person to person transfers, high mobility, freedom, possible to pay e-invoices. But, especially late adopters/older generation believe it is unsecure and difficult to use, which it is not Lindblom at PayEx ensures.

11.2 INTERVIEW 2 – ANONYMOUS

One of the biggest banks in Sweden (Bank X) offers m-banking services to their customers, where they have 319 000 users whereas 220 000 are active users. MPS will become an extension of this service with offering an alternative payment method.

The Swedish banks will communicate MPS to their costumers and educate them. Bank X believe that bankcards and MPS are more secure than cash since you have insurances if someone misuse your digital payment service such as Visacard, internetbanking, m-banking or MPS.

Benefits of MPS: Simplicity, Availability, fast , security (Security is Bank X main benefit claim)

The Swedish banking infrastructure is well-established and works very well today with its products (VISA, Mastercard, BGC etc.) but some of the parties may be unwilling to a change in already functional structures. Some companies have maybe done major investments recently that are not compatible with new technology.

11.3 TABLE 2

Measurement Items

Construct		Items	References (Gerhardt 2008)
Attitude towards using mobile payment services	ATT1*	Användning av MBT är en bra idé Using mobile payment services is a good idea	Fischbein and Azjen (1975) Yang and Yoo 2004
	ATT2*	Att använda MBT är intressant. Using mobile payment services is interesting	
Intention to use mobile payment services	INT	Finns möjligheten, kommer jag att använda mig utav MBT Given the opportunity, I will use mobile payment services	Venkatesh and Davis (2000) Schiertz (2009) Chen (2008)
Perceived usefulness of mobile payment services	PU1**	MBT är ett användbart betalningsätt Mobile payment services is a useful mode of payment	Venkatesh and Davis (2000) (Chen 2008) Nysveen (2005) Kim et al (2009) Schiertz (2009)
	PU2**	MBT är ett enkelt betalningsätt Using mobile payment services is easy	
	PU3	Det är fördelaktigt att använda MBT Using mobile payment services is beneficial	
	PU4	Det går snabbare att handla med hjälp utav MBT än med befintliga alternativ (t.ex biljettköp) Mobile payment services allow for a faster usage of mobile applications (e.g. ticket purchase)	
Perceived ease of use of mobile payment services	PEOU1**	Det är enkelt att förstå och att använda MBT It is easy to understand and use mobile payment services	Venkatesh and Davis (2000) (Chen 2008) Nysveen (2005) Kim et al (2009) chiertz (2009)
	PEOU2	Det är lätt att lära sig använda MBT It is easy to become skillful at using mobile payment services	
Perceived security of mobile payment services	PS1	Risken är låg att en obehörig tredje part kan se betalningsprocessen och använda informationen på ett skadligt sätt The risk of an unauthorized third party overseeing the payment process is low	Nysveen (2005) Schiertz (2009) Chen (2008)
	PS2	Risk för missbruk av konfidentiell information är låg vid användning av MBT (t.ex belopp, bank konto) The risk of abuse of confidential information (e.g. credit card number,	

		bank account data) is low when using mobile payment services	
	PS3	Jag upplever transaktioner gjorda med MBT som säkra I would find mobile payment services secure in conducting my payment transactions	
Perceived compatibility of mobile payment services	PC1**	Att använda MBT passar bra med min livsstil Using mobile payment services fits well with my lifestyle	Chen (2008) Schiertz (2009) Kim et al (2009)
	PC2	Att använda MBT passar bra med hur jag vill betala för produkter och tjänster Using mobile payment services fits well with the way I like to purchase products and services	
	PC3	Jag skulle uppskatta att använda mig utav MBT istället för existerande alternativ (t.ex kreditkort, kontanter) I would appreciate using mobile payment services instead of alternative modes of payment (e.g. credit card, cash)	
Subjective norm	SN1	Människor som är viktiga för mig tycker MBT är en bra idé People that are important for me would find using mobile payment services a good idea	Fischbein and Azjen (1975) Schiertz (2009) Nysveen (2005)
	SN2	Personer som är viktiga för mig skulle rekommendera mig att använda MBT People that are important to me would recommend using mobile payment services	

* = Only used for checking the validity of the intention to use construct.

** = Cleansed after the reliability test due to high correlations (>0.5) with other constructs.

11.4 TABLE 3

Descriptive Statistics

Construct N=320	Mean	Std.deviation
Intention to use	3.71	1.164
Perceived Compatibility	3.0781	1.13652
Perceived Usefulness	3.6187	0.95180
Perceived Ease of Use	3.6156	0.99485
Perceived Security	2.8948	0.87361
Subjective Norm	2.8609	0.92774