

UNIVERSITY OF TAMPERE
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**CONSUMER ADOPTION OF MOBILE NETBANK:
INNOVATION ATTRIBUTES AND PERCEIVED BARRIERS AS ADOPTION DIMENSIONS**

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ABSTRACT

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Mobile netbank was developed approximately one year ago to facilitate the use of mobile banking services with browser based mobile phones and to enable consumers to conduct banking whenever and wherever needed. However, the success of mobile commerce hinges on consumer willingness to adopt services based on new technologies. This thesis focuses on understanding and explaining the adoption process of mobile netbank by customers of Nordea Bank Finland Plc.

The thesis applies the dominant technology adoption theories: the technology acceptance model in consumer context (c-TAM), the adoption process of an innovation as well as the innovation resistance point of view, and tests their applicability in explaining mobile netbank adoption. Furthermore, the established technology acceptance models are enhanced by a new factor: perceived trust, which originates from the disciplines of consumer behavior in the use of financial services and which addresses the issues specific to mobile technology and mobile financial services adoption.

The empirical data of this thesis consist of a quantitative data set of a hypothetic-deductive approach. The empirical data explore first of all the determinants for consumer adoption of mobile netbank and indicate the importance of the generic attributes of technological innovations in adoption decisions in consumer context. The data establish specific factors of the adoption dimensions, and test measurement scales for the factors, and model and test their relation to the mobile netbank adoption process. Secondly, the data explore the innovation resistance determinants that affect the adoption of mobile netbank, and compare the means of perceived barriers and the intensity of the resistance. Furthermore, the effect of communications on the adoption of mobile netbank and on the consumer's decision making is explored.

This thesis contributes to the understanding of the adoption of mobile netbank and provides important implications for both academic research and practical development of the mobile netbank service. For researchers, the thesis offers a theoretically constructed and empirically validated model of technology acceptance in consumer context in the case of mobile netbank. This contributes to the understanding and explanation of mobile netbank adoption process. For practitioners, the study offers important information on the innovation attributes and perceived barriers of mobile netbank adoption among consumers, and thus provides guidance for future development of the service and its communication. Finally, this study suggests and lays ground for future research in the area of mobile banking.

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The opinions expressed here do not necessarily reflect the policy of Nordea Bank Finland Plc. The interpretations in this paper remain my own.

Helsinki, June 2007

Liisa Massinen

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ABSTRACT

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1 INTRODUCTION

1.1 Background of the study

Everyone is being exposed to new technologies and the effects of their implementation by others. Behavior and decisions of technological acceptance are formed not only from rational decisions based on information but also from everyday experiences, feelings, different sources and personal histories. However, many innovations affect people's lives. Sometimes one can choose how to engage with an innovation, that is, one can choose to adopt a technology or use it in a particular way. In many other cases one has no choice.

The study of adoption of technology is the study of how consumers engage with innovations, what they come to mean to them and how consumers negotiate the way the innovations shapes their lives. It looks at how consumers appropriate the products of industry and try to make them their own. Industry needs to understand how products and services are evaluated once they are launched, so it can exploit the consumer experience of services and products. (Bruner II & Kumar 2005; Davis 1989; Ram & Sheth 1989; Rogers 2003; Waite & Harrison 2002).

The adoption process encompasses how an individual encounters an innovation, how he or she engages with it, how decisions are made about it, what the process of actually obtaining the product or service is, and how it is implemented and used. However, in contrast to adoption, it is also important to understand why people do not adopt innovations: what attitudes, resources, limitations or lack of motivation lead consumers to ignore, delay, and resist new technologies that seem to hold so much promise. (Hirunyawipada & Paswan 2006; Ram & Sheth 1989).

During the last years, technological development has reshaped also the banking industry. It has become one of the leading sectors in utilizing new technology on consumer markets. The development of electronic banking services has made it possible to provide new kinds of added value for customers. At the same time the development of mobile communications technology, in addition to the use of telecommunications, has expanded vastly. Mobile netbank, and mobile commerce in general, can be facilitated through the availability of more data concerning customers' behavioral patterns and profiles.

The success of mobile commerce hinges on consumer willingness to adopt new technology and engage in activities using systems and devices different from what they have used in the past. Among other consequences, one direct result is that advertising will become even more targeted and customized. To be able to exploit the marketing potential correct, the customer's behavior and adoption patterns need to be understood.

1.2 Research objectives and questions

The study is done in co-operation with Nordea Bank Finland Plc and the Netbanks unit. The research objective of the study is to bring out consumers' perceptions of mobile netbank adoption. The aim is to illustrate the adoption of the innovation, i.e. mobile netbank, from a consumer's point of view and to identify the main dimensions, i.e. innovation attributes and perceived barriers, that consumers face during the adoption process. By using the theories of technology acceptance and innovation resistance as a framework, the aim of this paper is to understand the adoption of mobile netbank better and to explore the different reasons that slow down the adoption process.

From a theoretical perspective this study treats the mobile netbank service as a technological innovation and examines consumer perceptions on the mobile netbank adoption process to understand the driving and inhibiting factors that are behind consumers' adoption decisions better. The theoretical framework of the study is drawn from technology adoption theories (e.g. Bruner II & Kumar 2005; Davis 1989; Hirunyawipada & Paswan 2006; Ram & Sheth 1989), which contribute to the understanding of why people begin to use new technologies and which characteristics of technologies and individuals are influential in the adoption decision. The theoretical framework also exploits innovation resistance as well as the adoption process itself. It is argued that the most commonly used technology acceptance models have to be integrated into broader ones that include variables of process point of view. Therefore, the basic models are extended in this study also with the adoption process view-point to bring out the power of communications in the consumer's decision making.

The framework presented in this study will aim at conceptualizing various factors that influence the mobile netbank environment and identifying the distinct black spots in the adoption process by the end user. From a practical perspective the study can therefore be seen as problem-oriented. The

practical value comes out if some changes, adds or removes on the mobile netbank service itself, its marketing or its internal marketing on the grounds of this study may be done.

On the basis of the research objectives the primary academic question to be addressed is:

- *What dimensions affect a consumer's adoption process of mobile netbank?*

To gain a comprehensive understanding of the phenomenon under investigation and in order to be able to provide a sufficient justification for answering the primary research question, two subordinate questions are addressed:

- What are the perceived innovation attributes consumers face during the adoption process of mobile netbank?
- What are the perceived adoption barriers consumers face during the adoption process of mobile netbank?

Online banking acceptance has gained special attention in academic studies during the past years (e.g. Kaasinen 2006; Mallat 2006; Pikkarainen, Pikkarainen, Karjaluoto & Pahnla 2004; Suoranta 2003). In addition, mobile banking has gained more popularity as a research subject due to its topicality in today's banking environment. However, the reasons for not adopting mobile banking have not been sufficiently researched. More accurately, the barriers and innovation attributes as dimensions of technology adoption process have not been studied together in the case of mobile netbank. Therefore the aim of the study is to shed light on this. There is a need to understand users' acceptance of mobile netbank and to identify the factors affecting their intentions to use mobile netbank. Mobile banking services are still in their infancy, leaving a great deal of room for development (Luarn & Lin 2004). With the information received from this study, developers can be assisted in the building of mobile banking systems that consumers want to use, or help them discover why potential users avoid using the existing system.

1.3 Research limitations

Even though the study highlights various research areas within consumer behavioral research, it does not attempt to propose a model what would be fully universal. Rather, it should be viewed to some extent as an insight into the mobile banking research. The research focus is entirely on the consumer, with a number of the perceived attributes and barriers of an innovation. It should be noted, that this study examines the usage of one mobile banking service and not the whole mobile banking generally. The findings are bound by the selection of this research context, mobile netbank, and by the particular operationalisation of the variables adopted from the original research by Bruner II and Kumar (2005) and the c-TAM theory.

Although the research questions may identify some marketing elements that may contribute to the consumer's adoption process and that it would be useful to change on the grounds of the outcomes of this study, a wide analysis of marketing is defined outside this study. The models used as a basis for the theoretical framework of this study also discuss the value viewpoint and other drivers for the technological acceptance. In this study these elements are not investigated in depth because earlier research has widely concentrated on the value and drivers perspective of the acceptance. The resistance to adopt innovations has received relatively little marketing attention, even though understanding it is critical to the success of an innovation. In addition, differences between mobile phones, their models, design, and user interfaces may cause distinct adoption barriers; however, a comparative study between different devices is not done in this study.

1.4 Terminology

This study is done in co-operation with Nordea Bank Finland Plc. Further in this report the bank is referred as *Nordea*.

Mobile netbank is part of Nordea's mobile banking services together with WAP service and netbank's text version. The browser based mobile netbank service is meant especially for so called smart phones with a sizeable vertical display. *Mobile banking* in general is defined as a channel whereby the customer interacts with a bank via a mobile phone and conducts some banking, e.g. payment transactions (Barnes & Corbitt 2003; Scornavacca & Barnes 2004).

User in this study is a consumer, Nordea's personal customer, who has some experience of the mobile netbank service, i.e. he or she has logged into the mobile netbank, used the service, and made the decision to adopt the usage of mobile netbank.

Non-user in contrast is a consumer, Nordea's personal customer, who has not successfully logged into the mobile netbank service or has not even tried to log in and may not even know that a service called mobile netbank exists as a mobile banking service. The non-user segment also includes experimentalists who are consumers, Nordea's personal customers, who may have tried the mobile netbank service once or twice but have then decided for some reason to reject the usage.

Adoption means the situation where an individual takes a new product into use and initially some behavioral usage change appears. The adoption can be illustrated as an adoption or innovation-decision process where the individual passes the stages of knowledge, persuasion, decision, implementation, and confirmation. The adoption process encompasses how an individual encounters an innovation, how he or she engages with it, how decisions are made about it, what the process of actually obtaining the product or service is, and how it is implemented and used. (Bruner II & Kumar 2005; Rogers 2003).

Attributes are innovation characteristics that point out how the innovation itself can be analyzed to see how relevant and amenable to adoption and diffusion it may be, suggesting a number of important features to be considered in relating it to the individual's world it enters. (Davis 1989; Rogers 2003; Venkatesh & Davis 2000).

Adoption barriers are limits on resources preventing certain consumers from benefiting from advances that have found acceptance and use by others. Rejection implies making a choice not to adopt and use. However, there are other reasons that are very common, such as lack of resources and money, lack of skill, or total ignorance that there is an innovation to adopt at all. *Innovation resistance* is a special version of resistance to change. It is a normal consumer response to an innovation and adoption. Resistance can have various motivations that are based on specific fears and feeling of uncertainty. These factors can be seen as combining to create barriers to the adoption and use. (Hirunyawipada & Paswan 2006; Ram & Sheth 1989).

1.5 Literature review

The main literature used in this research is based on the works of Davis (1989) and his technology acceptance model as well as Bruner II and Kumar's (2005) technology acceptance model in consumer context, Rogers' (2003) innovation diffusion theory, and consumer resistance or adoption barriers research by, for example, Ram & Sheth (1989). These theories are presented as the basis for the framework of this study together with extensions of these theories and other theoretical references.

There have been a number of criticisms of diffusion research. Rogers himself (2003) criticizes the type of research that is conducted in practice. First of all, there is a lack of process orientation. Research tends to look at the moment of adoption, and not actually track the individual's decision process over time. Secondly, there is pro-innovation bias which assumes that all innovations are desirable. Legris, Ingham and Collette (2003) criticize the TAM models by Davis saying that the results shown by TAM are not totally consistent or clear. According to them, significant factors are not included in the models. Legris et al. (2003) point out, however, that the TAM model is useful when it is integrated into a broader model including variables related to both human and social change processes and to the adoption of the innovation model.

In this study the theory of technological acceptance is examined together with the process perspective of adoption. In addition, the perceived barriers are connected to the adoption process and innovation attributes. With the use of synthesis of many theories the study tries to find a fresh point of view to an individual's innovation adoption, although the widely exploited technology acceptance models are used. The technological acceptance model by Davis (1989) was originally used in an organizational context. In this study, the framework of research is based on the study by Bruner II and Kumar (2005) who have expanded the original TAM to consumer context in their own research. In addition, the factors of trust and risk are examined in this study to bring out some additional variables of mobile banking that the literature on normal online shopping or mobile commerce (m-commerce) may not perceive as vital.

1.6 The structure of the report

The work presented in the study represents a synthesis and extension of the three research streams that are identified in discussion in the report. The framework is based particularly on the c-TAM model by Bruner II and Kumar (2005). In addition, the perceived adoption barriers are presented using the innovation resistance model by Ram and Sheth (1989) as a basis for analysis. The dimensions in the framework present the construct that forms the research interest – the adoption of mobile netbank illustrated as a decision process during which an individual faces perceived barriers. In addition to innovation attributes, the adoption process and the perceived adoption barriers are investigated. The effects of a dimension on adoption are represented as hypotheses.

The structure of the report is illustrated in Figure 1. The content of this report includes eight different chapters. Introduction presents the background against which this research is undertaken and provides the motivation for research. The objectives and research questions are also laid out in this chapter. After the introduction a brief chapter of mobile netbank and mobile banking services in general is presented.

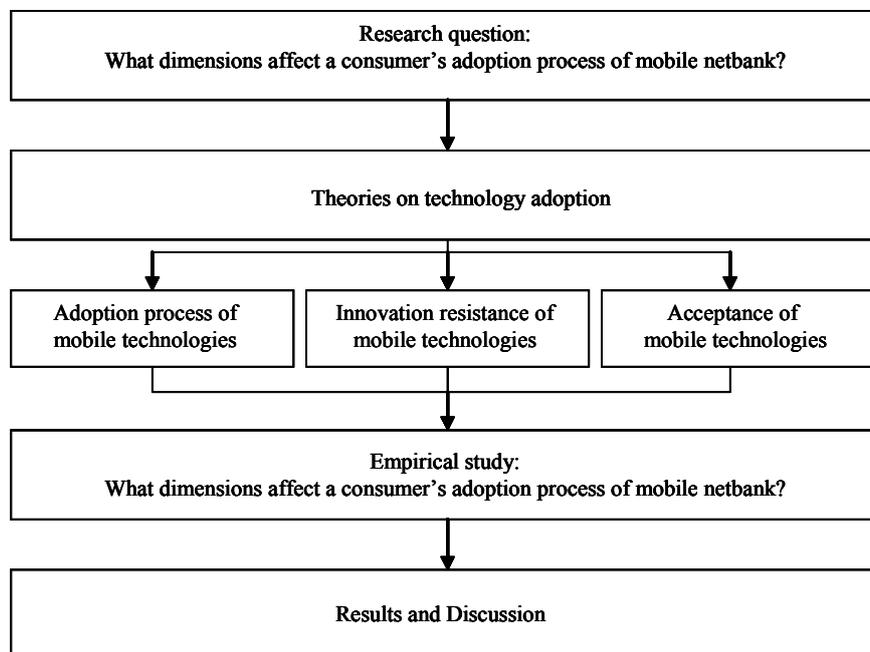


Figure 1: The structure of the report

In chapters 3 to 5 the literature concerning the research topic is reviewed and a synthesis of the constructs relevant to formulating the hypotheses and building the framework of the study is

presented. Chapter 3 briefly presents the diffusion of the innovation theory and the adoption process. Chapter 4 then takes a closer look at the innovation resistance point of view. Finally in Chapter 5, different theories of technology acceptance are reviewed and the basis for the framework of this study and also the hypotheses to be tested are presented.

The research methodology the hypothetic-deductive approach, data sourcing and method of analysis used in this study are presented in Chapter 6. Chapter 7 presents the findings of the empirical research. Thereafter, in Chapter 8, the results of the study are presented and conclusions are drawn. In addition, the topics for further research are discussed in Chapter 8.

2 MOBILE NETBANK IN THE FIELD OF M-COMMERCE

2.1 M-commerce

Mobile media is not a new phenomenon. It can take advantage of the mobility in three elements: people can move freely without being disconnected, devices are portable, and information moves freely and can reach specific recipients (Groebel, Noam & Feldman 2006). In the marketers' visions, the new world presented by mobile commerce (m-commerce) offers consumers the possibility to use their cell phones and other wireless devices to purchase goods and services just as they would over the Internet using their personal computers (PCs). *Specifically, m-commerce is referred to as a means for content delivery (notification and reporting) and transactions (purchasing and data entry) on mobile devices* (Zhang, Yuan & Archer 2004, 82). Unfortunately, in reality, m-commerce is often a highly frustrating experience. While m-commerce is still in its infancy, enhanced devices and networks are irrelevant unless m-commerce applications are compelling and user friendly. (Zhang et al. 2004).

M-commerce cannot be viewed simply as a new distribution channel, a mobile Internet or a substitute for PCs. Rather it is a new aspect of consumerism and a much more powerful way to communicate with customers. However, people will not shop or conduct banking with their phones in the same way they would with PCs. Unleashing the value of m-commerce requires understanding the role that mobility plays in people's lives. (Zhang et al. 2004).

Technological development and rapidly increasing usage rates of mobile phones have encouraged companies to develop different kinds of mobile services and put them on the market. This has made the adaptation of banking applications to enable their use with mobile devices also a logical development in electronic banking. In the increasingly competitive markets of financial services, mobile banking can be seen to provide added value for customers by offering more opportunities for conducting different banking actions. (Kaasinen 2005).

2.2 Mobile banking services and mobile netbank

Mobile banking is defined as the “*type of execution of financial services in the course of which – within an electronic procedure – the customer uses mobile communication techniques in conjunction with mobile devices*”. Moreover, it is defined as “*a channel whereby the customer interacts with a bank via a mobile device, such as a mobile phone or personal digital assistant*”. (Barnes & Corbitt 2003; Scornavacca & Barnes 2004).

Today mobile banking services enable consumers, for example, to request their account balance and the latest transactions in their accounts, to transfer funds between accounts, to make buy and sell orders for the stock exchange and to receive price information. In that sense, electronic banking can be seen as a concept covering all the electronic modes of conducting banking actions, and mobile banking as a subset of electronic banking.

Mobile netbank is a part of Nordea’s mobile financial services and it is a relatively new innovation – the service was launched in June 2006. In the mobile financial services field mobile netbank is part of mobile banking services together with SMS (Short Message Service) based services (see Figure 2). In addition to mobile banking services, mobile financial services include remote payment services, trust services and proximity payment services.¹

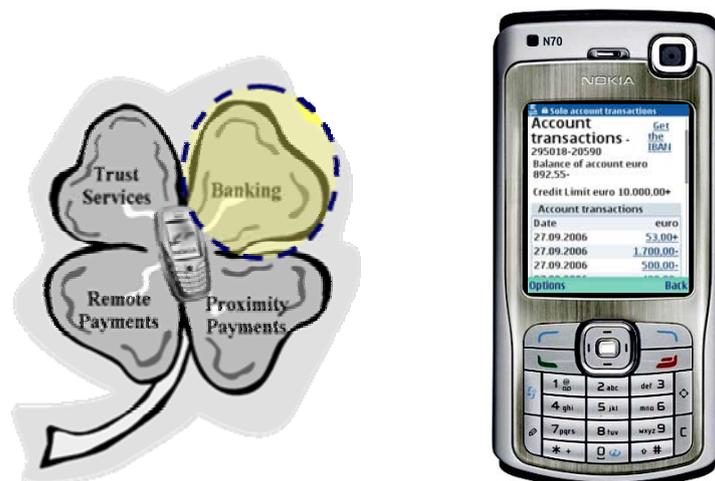


Figure 2: Mobile Financial Services and an illustration of the mobile netbank service

¹ ”Mobile netbank”. Intranet pages of Nordea Bank Finland Plc.
<https://intservices.sed1_root4_net/portal/internalportal/appmanager/nordeaportal/desktop/Content/Notes/intranet/homepage/home5026.nsf/aid/B0062EFE1F770DF4C1257232007B5ABE?OpenDocument&language=sf>. Read 14.5.2007.

Mobile banking services may be used through the WAP service (Wireless Application Protocol), netbank's text version and mobile netbank. *Netbank's text version* is designed for Internet terminals with a screen smaller than in a normal PC or a slow connection. Such equipments are, for example communicators. The functions and layout of netbank text version are almost identical to the netbank service accessed from PCs. Only the structure is simpler. *The WAP service* can be used when the phone has a WAP browser. This means that the WAP service is suitable for older phones and phones which have a smallish vertical display. The WAP service can also be used with smart phones although mobile netbank is especially intended for them. The new, browser based *mobile netbank* is meant especially for smart phones with a sizeable vertical display (having more space vertically than horizontally), for example, Nokia's Series 60 phones. The service is also intended for palmtops and for newer phones with no WAP browser. Mobile netbank includes the same services as netbank text version.² In this study the main focus is on the mobile netbank service.

2.3 The effect of the mobile phone characteristics on the usage experience

Kiljander (2004) categorizes mobile terminals according to the primary input mechanism and usage ergonomics as phones, personal digital assistants (PDAs), communicators and wearables (see Figure 3). Phones are operated with one hand, PDAs are used by holding the device in one hand and operating it with the other hand, communicators are held with both hands and operated mainly with the thumbs, and wearables are attached to the body or clothing and operated with one hand.



Figure 3: Examples of a media phone, a smart phone and a communicator

² "Via telephone". WWW pages of Nordea Bank Finland Plc.
<http://www.nordea.fi/sitemod/default/index.aspx?pid=760534> > Read 14.05.2007;
 "Mobile netbank". WWW pages of Nordea Bank Finland Plc.
<http://www.nordea.fi/sitemod/default/index.aspx?pid=868551> > Read 14.05.2007.

The term smart phone is used to characterize a mobile phone with special computer enabled features. These features may include email, Internet and web browsing, and personal information management. Typically the functionality of a smart phone can be further enhanced with add-on applications. The term media phone is often used to describe phones that include cameras and functionality for image messaging (Multimedia Messaging Service, MMS). (Alahuhta, Alhola & Hakala 2005).

Today, the difference between mobile phones and PDAs is getting more blurred as the screen sizes of phones are getting larger and the phones are equipped with different applications, and PDAs increasingly have network connections as a standard function. However, the main difference is still the numeric keypad and one-hand usage of most phones as opposed to the touch screens and two-hand usage of most PDAs. (Kaasinen 2005).

Mobile technologies and mobile phones elicit limitations on service adoption and usage. These limitations, therefore, place demands for service system design. The limitations mobile phones contain include, for example, small screen and keyboards, limited battery life, and imperfections in connection stability and reliability (Siau & Shen 2003). Moreover, service providers have to take into consideration that the variety of different mobile phone models that consumers use is increasing fast.

It is actually the consumers' devices that determine what specific services can be delivered. The boom in e-commerce applications is actually due to the widespread use of PCs, which have a complete text input keyboard, large screen, substantial memory and high processing power. Contrarily, various m-commerce applications rely on the use of handheld devices. Mobile devices have tiny screens, some of which display only three lines of text at once. In addition, some displays are only black and white with low resolution. Besides, because many mobile devices have limited bandwidth and small screens, any application that is heavily graphic or animation driven would not necessarily be most suitable and easy to use. Moreover, web browsers and drop-down menus are unavailable and companies must plan character-based terminal applications with cursors and key entry forms. Long selection lists or deep menu layers will wear out the fingers of even most patient users. (Zhang et al. 2004, 87).

However, in contrast to PCs, mobile phones do have their own unique features: they give the value of mobility with portable devices, smooth voice communication, and they are connected to persons

rather than to home or office. M-commerce opportunities can be very significant if investors understand consumer groups intimately and develop ubiquitous solutions that recognize the role that mobility plays in consumers' lives (Zhang et al. 2004, 87). Mobile consumers can access various services anytime and anywhere. To offer a consumer the best possible feeling of the service usage, it has to be clearly communicated which mobile banking service suits best for different mobile phones. The device used to access a service may be seen to have an effect during the adoption process of mobile technology on the usage experience and the attitude toward using the service again. (Bruner II & Kumar 2005).

3 ADOPTION PROCESS OF MOBILE TECHNOLOGIES

3.1 The innovation-decision process

At the same time with the emerging sophisticated technological markets, consumer resistance appears to be growing, especially resistance to new, high-tech alternatives to existing products consumers already use and understand. (Fain & Roberts 1997) With the help of the innovation diffusion theory and the process point of view, the consumers' adoption process and why some consumer resistance may occur before, during and after the process may be understood better. Ram (1987) argues that there are three sets of factors affecting adoption: perceived innovation attributes, consumer characteristics and communication.

Diffusion is a kind of social change defined as the process through which alteration occurs in the structure and function of a social system. When new ideas are invented, diffused, and adopted or rejected, leading to certain consequences, social change occurs. In the innovation diffusion theory (IDT) Rogers (2003, 6) formulated a general theory to explain adoption of various types of innovations.

The innovation-decision process (see Figure 4) is a process in which an individual passes the stages of gaining initial knowledge of an innovation, forming an attitude toward the innovation, making a decision to adopt or reject, implementing the new idea, and confirming this decision (Rogers 2003, 6). This process consists of a series of choices and actions over time through which an individual evaluates a new idea and decides whether or not to incorporate the innovation into ongoing practice. This behavior consists essentially of dealing with the uncertainty that is inherently involved in deciding on a new alternative to an idea previously in existence. The perceived newness of an innovation, and the uncertainty associated with this newness, is a distinctive aspect of innovation decision-making.

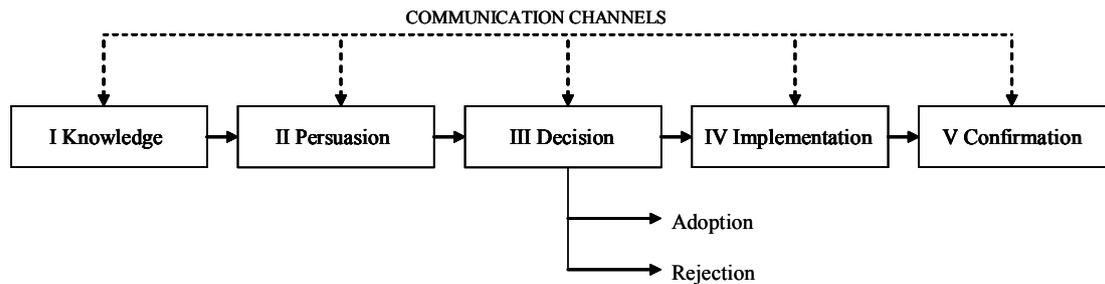


Figure 4: A model of the five stages in the innovation-decision process (Rogers 2003, 170)

People are most likely to have well-articulated preferences when they are familiar and experienced with the preference object, and rational choice is made. Even in such cases situational factors may intrude. (Bettman, Luce & Payne 1998) Rogers (2003) identifies a number of stages in adoption, taking the concept of adoption away from a simple decision to use towards a more complete model that accounts for the long awareness building and evaluation period that may occur before any actual use situation, including the possibility of trial and rejection, the importance of demonstration and recommendation, post-adoption re-evaluation and re-invention, and more creative consumer behavior.

Communication can be classified in two dimensions: the extent of marketer control and the type of consumer contact. At the beginning of adoption process communication is mainly marketer-controlled and impersonal, and mass media is the main source of information creating awareness about an innovation. In order to extent the awareness and adoption, communication should be clear, informative, credible and attractive. (Ram 1987, 211) Later in adoption process the meaning of interpersonal communication increases (Rogers 2003, 18–19). Marketer control decreases and communication changes to personal (Ram 1987, 211).

3.2 The knowledge stage

The innovation-decision process begins with the knowledge stage, which starts when an individual is exposed to an innovation’s existence and gains an understanding of how it functions. Some observers claim that an individual plays a relatively passive role when being exposed to awareness-knowledge about an innovation. If an individual becomes aware of an innovation by accident, the individual could not actively seek the innovation. Other individuals may gain awareness-knowledge about an innovation through behavior that they initiate, so their awareness-knowledge is not a passive activity. Then the predispositions of individuals influence their behavior toward

communication messages about an innovation and the effects that such messages are likely to have. Individuals tend to expose themselves to ideas that are in accordance with their interests, needs, and existing attitudes. Individuals consciously or unconsciously avoid messages that are in conflict with their existing predispositions. This tendency is called selective exposure, defined as the tendency to attend to communication messages that are consistent with the individual's existing attitudes and beliefs. (Rogers 2003, 170–173).

Individuals seldom expose themselves to messages about an innovation unless they first feel a need for the innovation, and even if individuals are exposed to innovation messages, such exposure will have little effect unless the innovation is perceived as relevant to the individual's needs and is consistent with the individual's attitudes and beliefs. This is called selective perception, defined as the tendency to interpret communication messages in terms of the individual's existing attitudes and beliefs. Selective exposure and selective perception act as particularly tight shutters on the windows of our minds in the case of innovation messages because such ideas are new. We cannot have consistent and favorable ideas about ideas that we have not previously encountered. The need for an innovation usually therefore precedes awareness-knowledge of the innovation. (Rogers 2003, 171–173).

A need is a state of dissatisfaction or frustration that occurs when an individual's desires outweigh the individual's actualities. An individual may develop a need when he or she learns that an innovation exists. Therefore, innovation can lead to needs as well as vice versa. Change agents may create needs among their clients by pointing out the existence of desirable new ideas. Thus knowledge of the existence of an innovation can create a motivation to learn more about it and ultimately to adopt it. (Rogers 2003, 172) The role of knowledge is studied in this paper especially as a prior condition affecting the other dimensions of the adoption.

3.3 The persuasion stage

At the persuasion stage in the adoption process the individual forms a favorable or unfavorable attitude toward the innovation. Attitude is a relatively enduring organization of an individual's beliefs about an object that predisposes his or her actions. Whereas the mental activity at the knowledge stage was mainly cognitive (or knowing), the main type of thinking at the persuasion stage is affective (or feeling). At the persuasion stage a general perception of the innovation is

developed. Such perceived attributes of an innovation as its relative advantage, compatibility and complexity are especially important at this stage. (Rogers 2003, 174–176) The c-TAM model by Bruner II and Kumar (2005) presented in this report later, takes the construct of different motivators into consideration from the viewpoint of utilitarian and hedonic factors. It is argued that the dimensions of usefulness, fun, and indirectly also the ease of use build the attitude toward the act of behavioral intention.

At the persuasion stage and at the decision stage, an individual seeks innovation evaluation information, i.e. messages that reduce uncertainty about an innovation's expected consequences. This type of information is sought by most individuals from their near peers, whose subjective opinions of the innovation (based on their personal experiences with adoption of the new idea) are more accessible and convincing to them (Rogers 2003, 176).

3.4 The decision and implementation stages

The decision stage takes place when an individual engages in activities that lead to a choice to adopt or reject an innovation. Adoption is a decision to make full use of an innovation. Rejection is a decision not to adopt an innovation. The innovation-decision process can just as logically lead to a rejection decision as to adoption. In fact, each stage in the innovation-decision process is a potential rejection point. Rejection can occur even after a prior decision to adopt. (Rogers 2003, 177–187) The role of rejection even after a prior decision to adopt is exploited in this study from the experimentalists' point of view. It may be seen as extremely interesting why the decision of rejection is made and what causes the feeling of uncertainty at this point.

Implementation occurs when an individual puts an innovation to use. Until the implementation the innovation decision process has been a strictly mental exercise of thinking and deciding. But implementation involves overt behavior change as the new idea is actually put into practice.

A certain degree of uncertainty about the expected consequences of the innovation still exists for the typical individual at the implementation stage, even though the decision to adopt has been made previously. Active information seeking usually takes place at the implementation stage in order to answer the arising questions. The role of change agents is mainly to provide technical assistance to the client as he or she begins to use the innovation. (Rogers 2003, 177–187).

3.5 The confirmation stage

A decision to adopt or reject the innovation is often not the terminal stage in the innovation-decision process. At the confirmation stage the individual seeks reinforcement for the innovation decision already made and may reverse the decision if exposed to conflicting messages about the innovation. (Rogers 2003, 177–179) Human behavior change is often motivated in part by a state of internal dissonance, i.e. an uncomfortable state of mind that an individual seeks to reduce or eliminate. A dissonant individual is motivated to reduce this condition by changing his or her knowledge, attitudes, or actions. (Rogers 2003, 189–192).

In the innovation diffusion theory and in the innovation-decision process the individual seeks information and confirmation to overcome the feeling of uncertainty. Uncertainty may be defined also as perceived barriers that the individual has to cross during the innovation-decision process. These perceived barriers and the feeling of uncertainty affect the perceived ease of adoption which has an effect on the intention and thereafter real usage behavior. Next chapter will define the adoption barriers that individuals may confront.

The rationale for information search behavior is that consumers view banking conditions as risky. The utility of information relates to its usefulness in reducing the amount of perceived risk and uncertainty involved in conducting the transaction under consideration. The greater the level of perceived risk, the more information will be required until perceptions reach levels acceptable for the consumer. (Waite & Harrison 2002) Communication is supposed to be informative, clear, trustworthy and attractive in order to encourage to adoption (Ram 1987, 211). If innovation is complex and consumer unsure of the usage, communication may reduce uncertainty and encourage to adoption. On the other hand, unclear marketing give rise to resistance even when there is a need for an innovation and ability to adopt it. The consumer will continue to search for information until its value becomes smaller than the cost involved in obtaining it (Waite & Harrison 2002). Because of the strong connection between communication and the innovation resistance, the point of view of the adoption process and communication's effect on it are a focus area of this study.

4 INNOVATION RESISTANCE OF MOBILE TECHNOLOGIES

4.1 Motivations of resistance

One of the major causes of market failure of innovations is the resistance they meet with consumers (Ram & Sheth 1989). New products also encompass uncertainties or risks which enhance the resistance to adoption. In response to this, different insights of the diffusion of innovations is present in this study; that is, while consumer innovativeness traits drive consumers to adopt new products, product newness encompasses perceived risks – a potential detriment to innovation adoption (Hirunyawipada & Paswan 2006).

The resistance to adopt innovations has received relatively little marketing attention, even though understanding it is critical to the success of an innovation (Suoranta 2003). Much consumer research on non-adoption looks at individuals and sees their non-adoption as some sort of a personal problem (Rogers 2003). Rogers (2003) points out that non-adoption is often a good, rational decision. Rejection implies making a choice not to adopt and use. However, there are other reasons that are very common, such as lack of resources and money, lack of skill, or total ignorance that there is an innovation to adopt at all.

Resistance can have various motivations that are based on specific fears and feelings of uncertainty. A resistance to innovation adoption perspective holds that novel attributes of new products embodying features (e.g. technological complexity, high price, newness) with unexpected side effects can create disruption in consumers' established routine. This may conflict with prior beliefs of consumers and result in resistance to adoption. When consumers venture into the adoption of new products, they face a dilemma between desirable and undesirable consequences of the adoption and hence face a risky decision. (Hirunyawipada & Paswan 2006) According to Hirunyawipada and Paswan (2006, 187) perceived risk can therefore be described as “*a function of the unexpected results of adoption and an outcome that deviates from expectation*”. However, perceived risk may not have much to do with actual adoption. It may lead to consumers seeking more information to ascertain the level of risk, mitigate the perception of risk, or manage the perceived risk. (Hirunyawipada & Paswan 2006).

Ram and Sheth (1989, 6) assert that an innovation may create a degree of change in the consumer's day-to-day existence and disrupt their established routines and therefore create resistance. Secondly, an innovation resistance occurs as an innovation may conflict with the consumer's prior belief structure. They also note that there is evidence in the marketing literature to illustrate the existence of innovation resistance. First, innovation resistance affects the timing of adoption and the resistance to the innovation breaks down over time. Second, innovation resistance varies in degree. Third, innovation resistance exists across product classes. (Ram & Sheth 1989, 6–7).

Ram and Sheth's (1989) conceptualization of innovation resistance provides justification for inclusion of adoption barrier discussion, i.e. investigation of the factors inhibiting the adoption of mobile netbank, in this study. In the case of mobile netbank much of the non-adoption may be seen to be based on limitations in the technology and the resources and skills of its potential users. The other main factors are negative expectations of adopting and using the technology. These factors can be seen as combining to create barriers to the adoption and use.

4.2 Categories of perceived barriers

Customers face several barriers that paralyze their desire to adopt innovations. These barriers may be grouped into two categories: functional and psychological barriers (see Table 1). The functional barriers relate to three areas: product usage patterns, product value, and risks associated with product usage. These barriers are more likely to arise if consumers perceive that adopting the innovation causes significant changes. (Ram & Sheth 1989) These kinds of innovations may be defined as discontinuous innovations and are defined as products that require one to change the current mode of behavior or to modify other services one relies on (Moore 1999). The higher the discontinuity of an innovation, the higher the resistance is like to be (Ram & Sheth 1989, 6).

FUNCTIONAL BARRIERS			PSYCHOLOGICAL BARRIERS	
Usage barrier	Value barrier	Risk barrier	Tradition barrier	Image barrier
<ul style="list-style-type: none"> Initial use requires a great deal of consumer learning. Continuing use requires total commitment to system. 	<ul style="list-style-type: none"> Requires purchase of software. Generally has additional monthly fee. 	<ul style="list-style-type: none"> Economic risk is moderate Performance risk is high. Social risk is low. 	<ul style="list-style-type: none"> Not the way consumer accustomed to paying bills, etc. 	<ul style="list-style-type: none"> Negative (“hard to use”) image of personal computers in general and online banking in particular.

Table 1: Barriers to innovation adoption – Examples of online banking (Fain & Roberts 1997)

The contrasting term, continuous innovations, refers to the normal upgrading of products that does not require one to change behavior (Moore 1999). Continuous innovations cause more psychological barriers and uncertainty. The psychological barriers arise from two factors: traditions and norms of the customers, and perceived product image. These barriers are more often created through conflict with customers' prior beliefs. (Ram & Sheth 1989) Hirunyawipada and Paswan (2006) have identified six key dimensions of perceived risk – i.e. financial, performance, physical, time, social and psychological risks. First four of these may be categorized into the functional dimension and last two into the psychological barriers.

Whereas other industries introduce discontinuous innovations only occasionally and with much trepidation, high-tech enterprises do so routinely (Moore 1999). Although the previous allocation of barriers divided them into functional and psychological barriers according to the continuance or discontinuance of the innovation, both the functional and psychological barriers may also be present at the same time in the case of one innovation.

4.2.1 Functional barriers

According to Ram and Sheth (1989 7) the most common reason for customer resistance to an innovation is that it is not compatible with existing workflows, practices, or habits. Innovations require a relatively long development process before gaining customer acceptance. This kind of barrier is called *a usage barrier*. Usage barriers may also be described as a performance risk, which is based on consumers' knowledge and cognitive abilities in a certain product domain.

The currently dominant mobile technologies have limitations which place demands for service system design and may restrict their use in certain transactions. The limitations include small screen and keyboards, limited battery life, limited processing power and memory, limited bandwidth, and imperfections in connection stability and reliability (Siau & Shen 2003). Another common concern affecting mobile netbank adoption decisions is the concern about large financial operations and investment costs (Alexander, Howells & Hine 1992; McFadyen 1987). Costs of mobile netbank adoption may include high commissions and fees charged by service providers, hardware and software updates and personnel training. Resources, such as money, time, and infrastructure, are key factors in adoption and resistance to technology.

The second functional barrier to an innovation is based on the value of the innovation. Unless an innovation offers a strong performance-to-price value compared with product substitutes, there is no incentive for customers to change. This is called *a value barrier*. (Ram & Sheth 1989, 7–8) The immaturity of the mobile market and the unclear value offered by mobile commerce are additional barriers that can be seen to have an effect on the adoption process (Frolick & Chen 2004; Gebauer & Shaw 2004).

The third barrier is *a risk barrier*. All innovations represent uncertainty and pose potential side effects that cannot be anticipated. Customers, who are aware of the risk, try to postpone adopting an innovation until they can learn more about it. This stage of information seeking was also pointed out in different phases of the innovation-decision process by Rogers (2003) in Chapter 3.

It is possible to distinguish four main types of risk inherent in an innovation. The first type of risk is physical risk, which is defined as the harm to person or property that may be inherent in the innovation. The second type of risk is economic risk, which reveals that the higher the cost of an innovation, the higher the perceived economic risk. The third risk type is due to performance uncertainty and is therefore commonly known as functional risk. The customer worries that the innovation may not have been fully tested and that therefore it is possible that it may not function properly or reliably. The fourth type of risk is social risk. The consumers may resist an innovation because they feel that they will face social ostracism or peer ridicule when they adopt it. (Ram & Sheth 1989, 8) In addition, Hirunyawipada and Paswan (2006) define risk barriers as financial and physical risks. Financial risk arises from the concerns over negative financial outcomes associated with new product adoption and deals with utilities that consumers gain at a price they would have to pay. Physical risk is associated with new product attributes that consumers have never been exposed to and that does not tap into the existing knowledge in their memory.

The most significant risk factors especially in mobile banking are consumers' concerns related to security and privacy of the service. It is possible to distinguish two main risks in online transactions: the possibility for a loss of privacy and the risk of monetary loss. Security is more related to the fear of financial loss, whereas privacy is connected to the ethical treatment of the personal information of the customer. Furthermore, confidentiality is a dominant issue in online banking security.

4.2.2 Psychological barriers

The first source of psychological resistance is the cultural change created for the customer by an innovation defined as *a tradition barrier*. When an innovation requires a customer to deviate from established traditions, it is resisted. (Ram & Sheth 1989) The tradition barrier mainly implies the change an innovation may cause in daily routines. If the routines are important to a consumer, the tradition barrier will most likely be high. Moreover, behavior that is contrary to consumer's societal and family values and social norms will cause the barrier. (Sheth & Ram 1987, 8–9).

Innovations acquire a certain identity from their origins, i.e. the product class, or industry to which they belong, or the country in which they are manufactured. If any of these associations are unfavorable, the customer develops an unfavorable image about the product, and there is a barrier to adoption. *The image barrier* is a perceptual problem that arises out of stereotyped thinking. (Ram & Sheth 1989, 8–9) Common concerns affecting mobile netbank adoption decision are the lack of critical mass or non-usage by customers. Mobile services represent a highly networked service where the benefits of the service depend upon the number of participants (Kauffman, McAndrews & Wang 2000).

Any innovative product that suffers from the existence of some of these barriers to adoption will have difficulties to succeed on the market. Online banking suffers from all of them. One implication from this example is that online banking will diffuse slowly. The second implication is that marketers can benefit from breaking the problem down into its components and developing a strategy to deal with each one of them. (Fain & Roberts 1997) Since mobile commerce technology is relatively new, many people may choose not to use the mobile banking service due to considerations or because they lack the required knowledge, skills, or ability to use the new information technology. Consequently, in this study, the point of view of perceived barriers is introduced to the theories on technology acceptance models used. In addition, research reveals that the perceived trust or credibility of users in relation to Web system has a striking influence on their willingness to engage in online banking and the exchange of money and sensitive personal information. (Luarn & Lin 2004).

5 ADOPTION OF MOBILE TECHNOLOGIES

5.1 Theories on technology adoption

Although a lot of resources have been spent on building mobile banking systems, reports on mobile banking show that potential users may not be using the systems, despite their availability. Thus, research is needed to identify the factors determining users' acceptance of mobile banking. (Luarn & Lin 2004).

According to Porter and Donthu (2006, 1000) two paradigms have emerged to explain technology adoption and acceptance. First of all the paradigm to explain an individual's propensity to use new technology, e.g. so called technology readiness index that delineates two drivers and two inhibitors of an individual's propensity to use new technologies. The second paradigm focuses on the other hand on how a technology's attributes affect an individual's perceptions and use of that technology. Technology acceptance model (TAM) by Davis (1989) is the most widely applied this theory paradigm (Porter & Donthu 2006).

While there has been considerable research on the technology acceptance model (TAM) that predicts whether individuals will accept and voluntarily use information systems, limitations of the TAM include the omission of an important trust-based construct in the context of mobile commerce, and the assumption that there are no barriers preventing an individual from using an information system if he or she chooses to do so. (Luarn & Lin 2004) Rogers (2003) points out in his innovation diffusion theory (IDT) how the innovation itself can be analyzed to see how relevant and amenable to adoption and diffusion it may be, suggesting a number of important features to be considered: relative advantage, compatibility, complexity, trialability and observability. Venkatesh, Morris, Davis and Davis (2003) have proposed a unified view for the technological acceptance model, the unified theory of acceptance and use of technology (UTAUT). They have compared the original technology acceptance model (TAM) with seven other user acceptance research approaches, including the innovation diffusion theory, theory of reasoned action and extended technology model (TAM2).

In this study the framework is adopted from the original TAM and the augmented c-TAM in consumer context by Bruner II and Kumar (2005). The TAM models behind the c-TAM are, however, first briefly discussed to give a sufficient background and arguments why these models used are compatible with this survey.

The concepts of risk and trust in electronic commerce are discussed in addition with the theories on technology acceptance. These factors are generally connected with the behavioral models, theory of reasoned action and technology acceptance model (Gefen, Karahanna & Straub 2003; Kaasinen 2005; Mallat 2006; McKnight, Choudhury & Kacmar 2002; Pavlou 2003; Suoranta 2003). Trust has been found to affect consumer adoption behavior either directly or through the attitude concept (Jarvenpaa, Tractinsky & Vitale 2000). The primary objective of this chapter is to extend the TAM, while retaining its parsimony and information systems focus in the context of mobile banking in a consumer context.

5.2 Technology acceptance model (TAM)

Davis presented the technology acceptance model (TAM) in 1989 to explain the determinants of user acceptance. The investigation focuses on two theoretical constructs: perceived usefulness and perceived ease of use. According to Davis (1989, 320) these two determinants are especially important variables that may influence information system usage. Davis (1989, 320) defines perceived usefulness as “*the degree to which a person believes that using a particular system would enhance his or her job performance*” and perceived ease of use as “*the degree to which a person believes that using a particular system would be free of effort*”.

The technology acceptance model points out that perceived ease of use and perceived usefulness affect the intention to use (see Figure 5). The perceived ease of use also affects the perceived usefulness. The intention to use, for one, affects the real usage behavior.

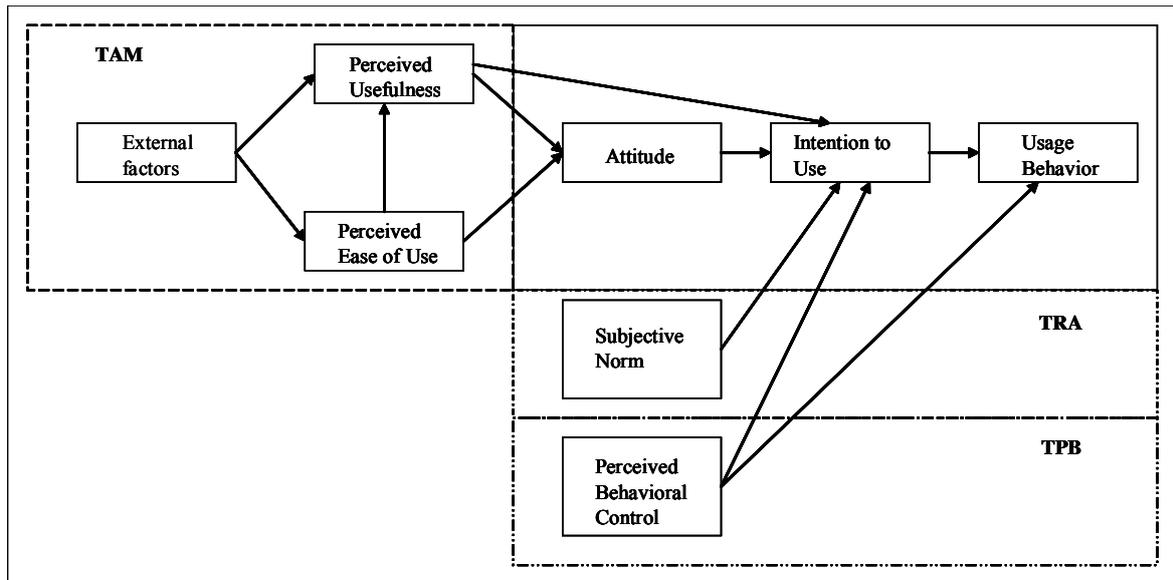


Figure 5: Theory of reasoned action (TRA), theory of planned behavior (TPB) and technology acceptance model (TAM) (Mallat 2006)

Rogers (2003, 15–16) refers to perceived usefulness in his innovation diffusion theory as a relative advantage and defines it as “*the degree to which an innovation is perceived as better than the idea it supersedes*”. The degree of relative advantage may be measured in economic terms, but social prestige factors, such as convenience and satisfaction are also important factors. What matters the most is whether an individual perceives the innovation as advantageous. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be. (Rogers 2003) Within each individual technology acceptance model, the factor of perceived usefulness is the strongest predictor of intention. (Venkatesh et al. 2003, 447).

Perceived ease of use can be compared to the concept of complexity used by Rogers (2003, 15–16). It is defined as “*the degree to which an innovation is perceived as difficult to understand and use*”. Most members of a social system readily comprehend some innovations; others are more complicated and are adopted more slowly. According to Venkatesh et al. (2003, 447), the factor of perceived ease of use is significant during the first time period, becoming insignificant over periods of extended and sustained usage. This deduction is supported also by the c-TAM model by Bruner II and Kumar (2005) that is presented in this report later on. They postulate that the utilitarian factor of ease of use has a significant effect in the early phases of the adoption process, whereas more hedonic factors become more important as the usage gets easier.

Davis (1989) designed the model to study information systems at work to predict if the users will actually take a certain system into use in their job. The model has been tested and extended by many researchers since then, including Davis himself (Davis & Venkatesh 2000; Konana & Balasubramanian 2004; Porter & Donthu 2006; Yang & Yoo 2003). The model provides a tool for studying the impact of external variables on internal beliefs, attitudes and intentions in the case of technology acceptance and therefore also in the case of mobile netbank. Previous research on mobile technology and services adoption suggests that ease of use and usefulness are important factors for predicting adoption intentions and actual use (Bruner & Kumar 2005; Hung, Ku & Chang 2003; Jarvenpaa, Lang, Tadeka & Tuunainen 2003; Kleijnen, Wetzels & Ruyter 2004; Nysveen et al. 2005; Teo & Pok 2003).

5.2.1 Theory of reasoned action (TRA)

The technology acceptance model by Davis (1989) is based on the theory of planned behavior (TPB), an extension of the theory of reasoned action (TRA). The theory of reasoned action is a model to predict consumer adoption intention. Both the theory of reasoned action and the theory of planned behavior assert that behavior is a direct function of behavioral intention.

According to Peter and Olson (2005, 152), Fishbein's theory of reasoned action identifies the attitudinal factors that influence specific behaviors (see Figure 5). They say that Fishbein recognized that people's attitudes toward an object may not be strongly or systematically related to their specific behaviors. Rather, the immediate determinant of whether consumers will engage in a particular behavior is their intention to engage in that behavior.

Fishbein's model is called the theory of reasoned action because it assumes that consumers consciously consider the consequences of the alternative behaviors under consideration and choose the one that leads to the most desirable consequences. The outcome of this reasoned choice process is an intention to engage in the selected behavior. This behavioral intention is the single best predictor of actual behavior. That is, the theory of reasoned action proposes that any reasonably complex, voluntary behavior is determined by the person's intention to perform that behavior. According to this theory, people tend to perform behaviors that are evaluated favorable and are popular with other people. They tend to refrain from behaviors that are regarded unfavorable and are unpopular with others. (Peter & Olson 2005, 152).

5.2.2 Theory of planned behavior (TPB)

The theory of planned behavior extends the theory of reasoned action by incorporating a third construct in the model (Ajzen 1988; Ajzen & Madden 1986). The theory of planned behavior postulates that behavioral intention is a function of attitude and a subjective norm (see Figure 5). However, an additional construct compared to the theory of reasoned action, perceived behavioral control, is added to the model to account for situations where an individual has less than complete control over the behavior. (Taylor & Todd 1995, 139).

Perceived behavioral control reflects beliefs regarding access to the resources and opportunities needed to perform a behavior. Perceived behavioral control appears to encompass two components according to Taylor and Todd (1995, 139). The first component is facilitating conditions, which reflects the availability of resources needed to engage in a behavior. This might include access to the time, money or other specialized resources required to engage in a behavior. The second component is self-efficacy – that is, an individual’s self-confidence in his or her ability to perform a behavior.

Perceived behavioral control will influence both behavior and behavioral intention. Behavior is influenced directly to the extent that perceived behavioral control reflects actual ability to perform the behavior. An indirect effect through intention is based on the notion that perceived behavioral control would have a motivating (or demotivating) influence based on an individual’s assessment of the likelihood of success. (Taylor & Todd 1995, 139).

Teo and Pok (2003) have studied the adoption of WAP phones among Internet users in Singapore and found that perceived behavioral control is insignificant in predicting use intention. Hung et al. (2003) studied the adoption of WAP services in Taiwan and found that while perceived behavioral control was insignificant in predicting use intention, it was significant in predicting actual use. Nysveen et al (2005), on the other hand, found support for the significance of perceived behavioral control in determining the use intentions of different mobile services.

5.3 The enhanced technology acceptance model (TAM2)

Venkatesh and Davis (2000) wanted to have a better understanding of the determinants of perceived usefulness which would enable the design of organizational interventions that would increase user acceptance and usage of new systems. Therefore, the goal of the research of Venkatesh and Davis in 2000 was to extend TAM to include additional key determinants of TAM’s perceived usefulness and usage intention constructs, and to understand how the effects of these determinants change with increasing user experience over time with the target system.

Figure 6 shows the proposed model by Venkatesh and Davis (2000, 187) referred to as TAM2. Using TAM as the starting point, TAM2 incorporated additional theoretical constructs spanning social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use).

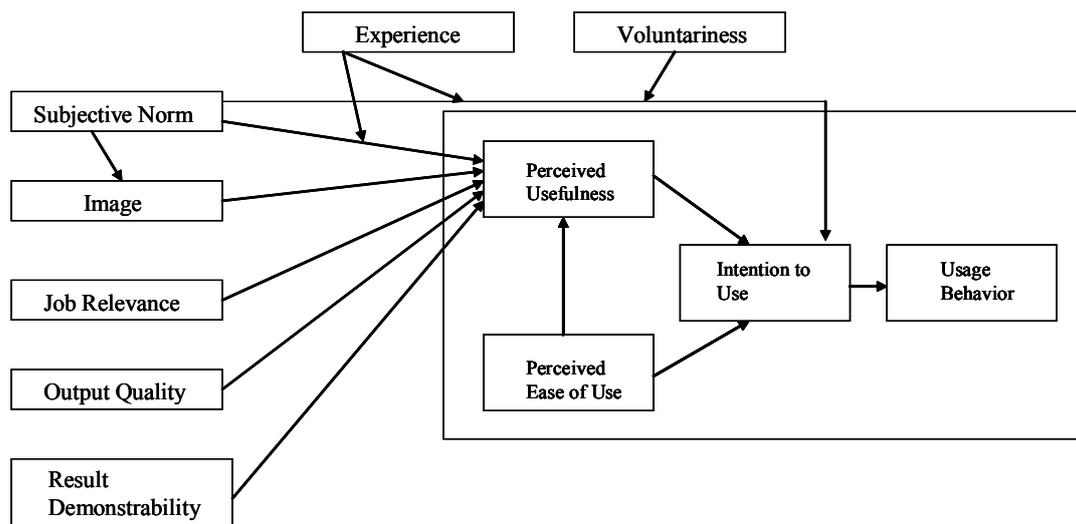


Figure 6: The enhanced technology acceptance model – TAM2 (Venkatesh & Davis 2000, 188)

TAM2 reflects the impacts of three interrelated social forces impinging on an individual facing the opportunity to adopt or reject a new system: subjective norm, voluntariness, and image. Subjective norm is defined as a “*person’s perception that most people who are important to him think he should or should not perform the behavior in question*”. To distinguish between mandatory and voluntary usage settings, the model posits voluntariness as a moderating variable, defined as “*the extent to which potential adopters perceive the adoption to be non-mandatory*”. Individuals often respond to social normative influences to establish or maintain a favorable image within a reference

group. The effect is captured in TAM2 by the effect of subjective norm on image, coupled with the effect of image on perceived usefulness. (Venkatesh & Davis 2000, 187–189).

Venkatesh et al. (2003, 447) point out the significance of social influence during the adoption. Social influence is defined in UTAUT as “*the degree to which an individual perceives that important others believe he or she should use the new system*”. Social influence as a direct determinant of behavioral intention is represented as a subjective norm in the theory of reasoned action as well as in TAM2, and as an image in innovation diffusion theory.

Beyond the social influence processes affecting perceived usefulness and usage intention, Venkatesh and Davis (2000, 190) theorize four cognitive instrumental determinants of perceived usefulness: job relevance, output quality, result demonstrability, and perceived ease of use. They argue that people form perceived usefulness judgments in part by cognitively comparing what a system is capable of doing with what they need to get done. TAM2 theorizes that people use a mental representation for assessing the match between important work goals and the consequences of performing the act of using a system as a basis for forming judgments about the use-performance contingency (i.e., perceived usefulness). (Venkatesh & Davis 2000, 190–191).

Rogers (2003, 15–16) refers to compatibility as an additional factor of innovations and defines it as “*the degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters*”. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible. (Rogers 2003) This is referred to as facilitating conditions in the UTAUT model by Venkatesh et al. (2003, 447) and it is defined as “*the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system*”. According to Venkatesh et al. (2003, 447), facilitating conditions have a direct influence on usage beyond that explained by behavioral intentions alone. Facilitating conditions are also modeled as a direct antecedent of usage. Compatibility may be seen as a part of perceived usefulness.

TAM2 theorizes the effect of output quality as a variable affecting the adoption. Rogers (2003, 15–16) refers to trialability and defines it as “*the degree to which an innovation may be experimented with on a limited basis*”. New ideas that can be tried on the installment plan will generally be adopted more quickly than innovations that are not divisible. An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, as it is possible to

learn by doing. (Rogers 2003) In addition, observability has its effect on the adoption process especially through communication. Rogers (2003, 15–16) defines observability as “*the degree to which the results of an innovation are visible to others*”. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt.

Innovations that are perceived by individuals as having greater perceived usefulness, ease of use, compatibility and observability, and less complexity will be adopted more rapidly than other innovations. These factors provide inputs to the adoption process which takes into account attitudes and awareness about products (cognitive processing), the uncertainty and risk of adoption (including financial risk, social risk, credibility risk etc), pre-existing activities that will influence and be affected by adoption, and finally competitive innovative solutions. (Rogers 2003, 15–16).

The technology adoption models are widely used to study organizational adoption processes. Bruner II and Kumar (2005) have used the technology acceptance model from the work environment and applied it to a consumer context and extended it by incorporating both utilitarian and hedonic aspects of technology use. The key difference between workplace and consumer contexts with respect to TAM is that, in the latter, a hedonic factor may be an important addition to the model (Childers, Carr, Peck & Carson 2001; Dabholkar & Bagozzi 2002).

5.4 Technology acceptance model in a consumer context (c-TAM)

The emerging mobile commerce technology promises exciting possibilities for marketplace exchange, but expected benefits to consumers as well as business await an understanding of consumer acceptance of this technology. Creating and delivering customer value is a precondition for business to survive (Bruner II & Kumar 2005). The c-TAM model by Bruner II and Kumar (2005) investigates TAM in a consumer context that is augmented with a hedonic factor together with the utilitarian aspect. Further, it examines how two external variables, device used to access the Internet and consumers’ preferred style of processing influence variables in TAM model. In the c-TAM model the usage behavior has been excluded from the research scope. The model emphasizes the effect of attitude toward the act and its direct effect on the behavioral intention.

Porter and Donthu (2006) have studied consumer acceptance of technological innovations and the role of perceived access barriers and their effect especially on attitude toward the act of using a

certain system. However, their focus was merely on the demographic barriers point of view, e.g. age or income level. In addition, McKechnie, Winklhofer and Ennew (2006) have applied the original TAM to online retailing of financial services and found out that the TAM model is helpful but additional links need to be included. McKechnie et al. (2006, 388) emphasized in their model the determinants of past experience with Internet and attitudinal aspects, i.e. positive emotions toward the Internet as a distribution channel for financial services. Although the original TAM model has been extended and modified in various researches, the c-TAM model by Bruner II and Kumar (2005) was selected as a basis of this survey, because its ability to take both the utilitarian and hedonic perspectives into account in a consumer context.

The utilitarian perspective is traditionally based on the assumption that consumers are rational problem-solvers. The utilitarian perspective stresses functional thinking and consumer decision processes as Rogers' (2003) innovation-decision process. However, in a consumer context a hedonic perspective has an effect on the decisions individuals make, according to Bruner II and Kumar (2005, 553–554). Hedonic consumption stresses the emotional aspects of one's experience during the adoption process.

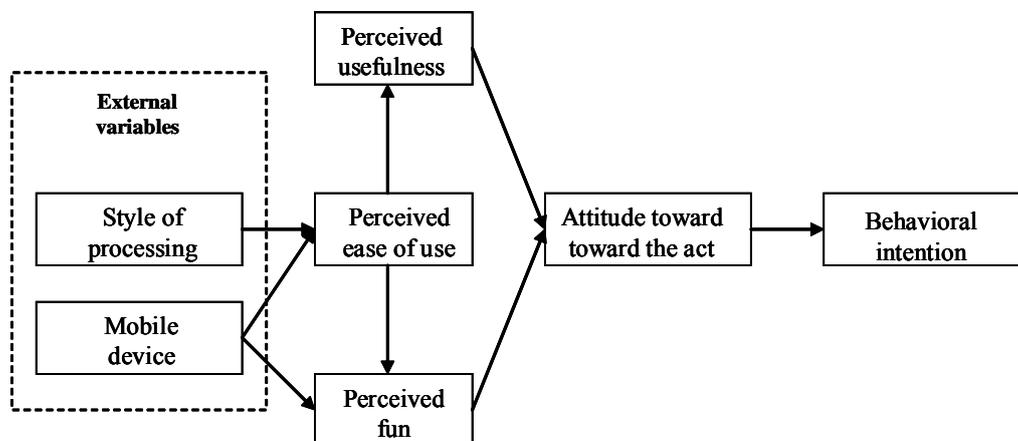


Figure 7: The technology acceptance model in a consumer context – c-TAM (Bruner II & Kumar 2005, 554)

Figure 7 presents the technology acceptance model in a consumer context by Bruner II and Kumar (2005, 554). The central idea underlying TAM is that a person's behavioral intention to use a system is determined primarily by two assessments: its usefulness and its ease of use (Davis 1989; Venkatesh & Davis 2000). Usefulness has to do with the degree to which a person believes a certain system will help perform a certain task. In contrast, ease of use has to do with the extent to which a

person thinks that the use of a system will be relatively free of effort. (Bruner II & Kumar 2005, 554–555).

Bruner II and Kumar (2005, 554) posit that ease of use influences the attitude toward the act of using the system, which in turn affects behavioral intention, through two mechanisms: one is by influencing subjects' perceptions of how useful a system is (the utilitarian path) and the other is by influencing their perceptions of the fun/enjoyment associated with using the system (the hedonic path). The attitude toward the act of using the system is therefore an overall evaluation, encompassing both utilitarian and hedonic components; hence, it is viewed as completely mediating the effects of antecedent variables like ease of use. Bruner II and Kumar (2005, 554) say that ease of use is likely to have only indirect effects on the attitude toward the act as well as the behavioral intention and direct effects on usefulness and the hedonic construct. This can be seen to be on par with the findings by Porter and Donthu (2006) as well.

The theoretical framework of the c-TAM leads to the following hypotheses being proposed. The first four hypotheses test the validity of the basic TAM model in a consumer context.

H₁: In consumer contexts, the perceived usefulness of mobile netbank has a direct, positive effect on one's attitude toward using it.

H₂: In consumer contexts, the perceived ease of use of mobile netbank has an indirect effect on one's attitude toward using it.

H₃: In consumer contexts, the perceived ease of use has a direct, positive effect on perceived usefulness (a) and perceived fun (b).

H₄: In consumer contexts, the attitude toward using mobile netbank has a direct, positive effect on the intention to use it.

The original TAM posited and found that ease of use affected usefulness of a system in work place environments (Davis 1989; Venkatesh & Davis 2000). The c-TAM expects that, as consumers believe systems are easier to use, they are likely to also perceive these systems to be more useful as they can spend their time doing other things than figuring out how to use the system (Bruner II & Kumar 2005, 554–555).

Similarly, systems that are easier to use will also be perceived as more fun to use than those that are more cumbersome and frustrating to use. Consumers are likely to derive greater enjoyment from

and have more fun doing a given task on a system that is easier to use than a system that is more cumbersome to use. As systems become easier to use, they provide users with a greater sense of mastery that, in turn, leads to greater enjoyment and fun. (Bruner II & Kumar 2005, 555).

Thus, Porter and Donthu (2006, 1001) raise in their study that users tend to overcome difficulties in using new technology if the benefits of usage are substantive. That is, the more an individual perceives a system to be easy to use, the more the individual perceives the system to be useful. Furthermore, it is addressed that the more an individual perceives the system to be easy to use, the more favorable that individual's attitude toward the use of the system is. (Porter & Donthu 2006, 1001).

The fifth hypothesis extends the basic TAM model by explicitly incorporating fun adopted from the c-TAM model by Bruner II and Kumar (2005) and, in addition, the sixth hypothesis takes into account the device used to accomplish a task, which is studied as an external variable of the model.

H₅: In consumer contexts, the perceived fun using mobile netbank has a direct, positive effect on one's attitude toward using it.

H₆: In consumer contexts, the device used to accomplish a task will have an effect on consumer perceptions of the ease of use (a) and fun (b) associated with using the device.

Due to the role that style of processing might very well play with handled mobile devices with limited text and/or visuals, it is tested for its effects on c-TAM. It is viewed as fitting in the external variables portion of the model. Specifically, it is expected that those consumers who are predisposed towards visual mode processing will have better attitudes and reactions than those with low visual orientations when they use devices to access the web and mobile netbank and perform tasks. The high use of mental imagery while performing online tasks seems likely to affect perceptions of a device's usefulness, ease of use, and fun. (Bruner II & Kumar 2005, 555) From this, the following hypothesis is drawn:

H₇: A person's style of processing will have an overall effect on mobile netbank adoption. Specifically, consumers with a high visual orientation will perceive devices used to access mobile netbank to be more fun, easier to use, and more useful than consumers with a low visual orientation.

5.5 The c-TAM and the concept of perceived trust

The concept of perceived trust has been included in the adoption studies of financial services as an additional factor affecting consumer adoption of innovations. Perceived trust has also been deemed as an important adoption determinant in the context of electronic commerce research (Jarvenpaa et al. 2000; Pavlou 2003). Besides, risk has been studied in the context of electronic commerce as another construct closely related to perceived trust. The relation between trust and risk is two-fold. First, trust reduces the perceived risk and facilitates the adoption of electronic commerce (Jarvenpaa et al. 2000; Pavlou 2003). On the other hand, without any perceived risk there is no need to trust either (Mitchell 1999; Jarvenpaa et al. 2000).

Mayer, Davis and Schoorman (1995) define trust as “*the willingness of a party to be vulnerable to the actions of another party based on the expectations that the other party will perform a particular action important to the trustor, irrespective to the ability to monitor or control that other party*”. Lee (2005) has studied the impact of trust on attitudes towards and the intention to use mobile commerce services. The study identified five significant antecedents of trust in mobile commerce, including user control, responsiveness of the site, connectedness (i.e. information and advice sharing among the site users), ubiquitous connectivity and access to the site, and contextually relevant, timely offers (Mallat 2006, 36).

Due to the task of doing some banking that is processed via mobile netbank, the effect of perceived trust on the adoption of mobile netbank is also tested. It is viewed as affecting the attitude toward using it.

H₈: In consumer contexts, the perceived trust of using mobile netbank has a direct, positive effect on one’s attitude toward using it.

Communication of the use and usefulness of mobile netbank may provide some crucial information for the consumers during their adoption process as they cross different functional and psychological adoption barriers (Ram & Sheth 1989; Rogers 2003; Waite & Harrison 2002). The basic TAM and also the extended c-TAM do not take into consideration the view point of adoption process. They rather think the adoption as a single point of decision. The adoption process, however, has many decision points and the innovation resistance affect throughout the whole process. With clear and visible communication the individual may be help to cross the perceived barriers that create

adoption resistance. As Waite and Harrison (2002, 312) point out, consumer financial decision making relies on a core of information and they must have access to this information on a timely and regular basis. Therefore, communication is viewed as having an effect on the adoption of mobile netbank as an external variable.

H₉: In consumer contexts, communication will affect one's attitude toward using mobile netbank (a) as well as the behavioral intention to take the service into use (b).

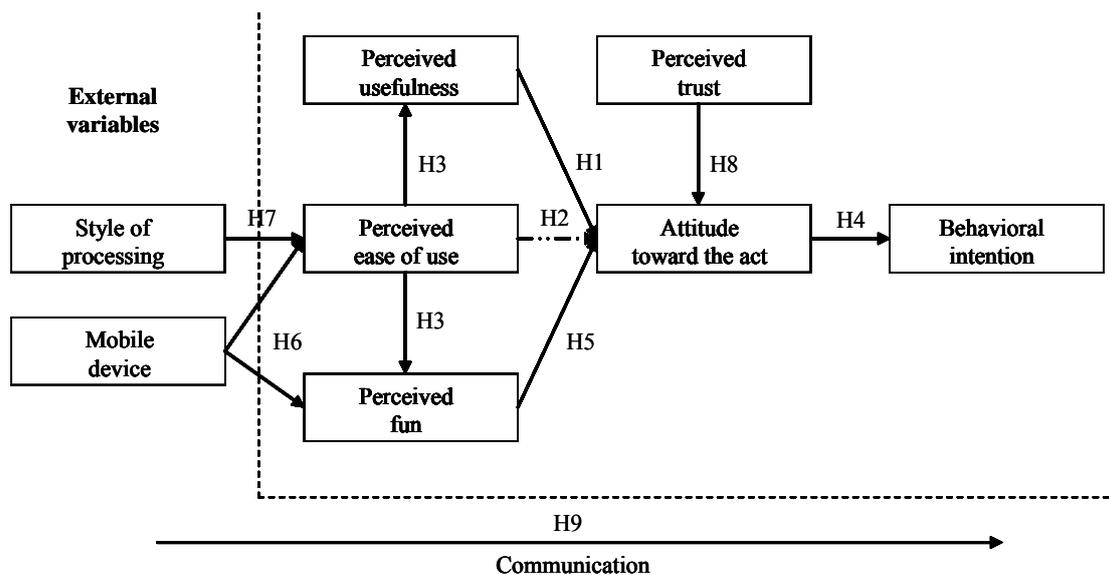


Figure 8: Theoretical framework of research and hypotheses to test the model

The theoretical framework formulated from the c-TAM and relating research literature is illustrated in figure 8 above, together with the hypotheses that are postulated to test the mobile netbank adoption process from the consumer's point of view. The operationalisation of the variables is directly adopted from the theory of c-TAM used by Bruner II and Kumar (2005). The operationalisation is presented in Appendix 1 together with other statements used in the questionnaire to get more practical insight of the adoption process of mobile netbank. Furthermore, some expert interviews were made to assess the operationalisation of the hypotheses and the theory behind them especially regarding the statements outside the Bruner II and Kumar's (2005) original c-TAM operationalisation.

6 RESEARCH METHODOLOGY AND DESIGN OF THE STUDY

6.1 A hypothetic-deductive approach

Information system research has predominantly been guided by the positivist research tradition (Mallat 2006; Newman & Benz 1998). The paradigm of positivism and quantitative research continues to dominate social and behavioral science as well. The positivist view is objective and the items under study are maintained as apprehensible, quantifiable, and measurable. The research process follows a hypothetic-deductive logic where hypotheses are derived from prior theory and tested most commonly through controlled experiments or statistical analysis. The aim of the study is to discover universal laws of human behavior. (Lee & Baskerville 2003) Figure 9 illustrates the quantitative research continuum.

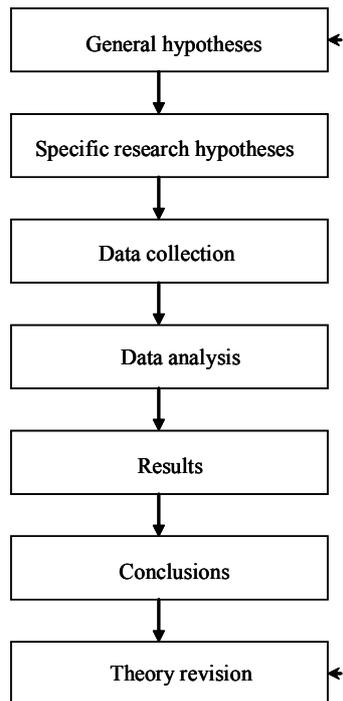


Figure 9: Quantitative research continuum and the hypothetic-deductive approach (Newman & Benz 1998)

The quantitative research with a hypothetic-deductive approach begins with theory. From the theory, prior research is reviewed and from the theoretical frameworks, hypotheses are generated. These hypotheses lead to data collection and the strategy needed to test them. The data are analyzed

according to the hypotheses, and finally conclusions are drawn. These conclusions confirm or conflict with the theory. (Newman & Benz 1998).

6.2 Testing the hypotheses

Setting up and testing hypotheses is a part of statistical inference. In order to formulate such a test, a theory has been put forward, because it is to be used as a basis for argument, but has not yet been proved statistically. In each problem considered, the question of interest is simplified into two competing claims or hypotheses between which we have a choice; the null hypothesis, denoted H_0 , against the alternative hypothesis, denoted H_1 . These two competing hypotheses are not, however, treated on an equal basis; special consideration is given to the null hypothesis. This is due to the fact that the null hypothesis relates to the statement being tested, whereas the alternative hypothesis relates to the statement to be accepted if the null is rejected. The outcome of a hypothesis test is 'reject H_0 ' or 'do not reject H_0 '. The null hypothesis is a hypothesis of no difference. In other words, the null hypothesis would most likely be that there is no difference between methods ($H_0: \mu_1 - \mu_2 = 0$). The alternative hypothesis would be $H_1: \mu_1 \neq \mu_2$. (Alkula, Pöntinen & Ylöstalo 2002; Metsämuuronen 2005).

A hypothesis is a limited statement regarding cause and effect in specific situations; it also refers to our state of knowledge before experimental work has been performed and perhaps even before new phenomena have been predicted. The word model is reserved for situations when it is known that the hypothesis has at least limited validity. The hypothesis is worded so that it can be tested. This is done by expressing the hypothesis using the independent variable (the variable that changes during the experiment) and the dependent variable (the variable that changes in response and depends on changes in the independent variable).³

The significance level of the study is set to the 0.05. The probability value (p value) is the probability of obtaining a statistic as different or more different from the parameter specified in the null hypothesis as the statistic computed from the data. The calculations are made assuming that the null hypothesis is null. The probability value is compared with the significance level. If the probability is less than or equal to the significance level, then the null hypothesis is rejected; if the

³ Anonyymi. Ei päiväystä. *Menetelmäopetuksen valtakunnallinen tietovaranto*. [WWW-document]. <<http://www.fsd.uta.fi/menetelmaopetus/index.html>>. Read 27.4.2007.

probability is greater than the significance level then the null hypothesis is not rejected. When the null hypothesis is rejected, the outcome is said to be statistically significant. On the other hand, when the null hypothesis is not rejected, the outcome is said to be statistically insignificant. If the outcome is statistically significant, the null hypothesis is rejected in favor of the alternative hypothesis. (Alkula et al. 2002; Metsämuuronen 2005).

6.3 Data collection

An online survey was selected as a method for its ability to encompass the phenomenon at its best on a large scale. Typically, the questionnaire survey method sacrifices some of the depth of the results as compared to more qualitative methods, but in this case breadth is more of interest since the aim is to obtain findings that are generalisable. Interviewing the bank customers on a large scale might be an option, but the constraints of budget and time impose the need for self-administered instrument via Internet.

The questionnaire collected data on respondents' perceptions to mobile netbank adoption in order to explore the different dimensions that affect the adoption process. All the operationalisations of the hypotheses were done according to Bruner II and Kumar's (2005) c-TAM model and original 26 variables were used. A five-point Likert scale (1 = totally disagree, 5 = totally agree) was used to measure the level of agreement with each of the statements. Likert scaling is a bipolar scaling method measuring either positive or negative response to a statement. Likert scales may, however, be subject to distortion from several causes. Respondents may avoid using extreme response categories (defined as central tendency bias); agree with statements as presented (defined as acquiescence bias); or try to portray themselves in more favorable light (defined as social desirability bias). (Alkula et al. 2002; Metsämuuronen 2005).

In addition to the c-TAM variables, 20 other specific variables about the adoption of mobile netbank were presented to receive more practical information in order to see if there was resistance toward the innovation, what the resistance was like and how the respondents differed in their perceptions.

The questionnaire was placed on the log-out page of Nordea's online service in Finland, thereby only reaching users of online banking services (see Appendix 2 of a picture of the log off –pages).

The questionnaire was open for 30 hours from 9:00 AM on March 29th 2007 to 3:00 PM on March 30th 2007. The group of customers that answered the questionnaire formed a sample of Nordea's personal customers.

The questionnaire (see Appendix 3) was placed on the netbank's log-out page because the aim was to reach non-users of mobile netbank that can be seen as potential users of the service. Mobile netbank is designed to create added value for customers as an additional service to use, for example, in a situation where you have no PC and Internet access but you would need to conduct some banking business. Therefore the users of electronic netbank may be seen as potential users of mobile netbank as well. Some of the respondents were users of mobile netbank but it was not seen as a hindering factor. Before placing the questionnaire on the log-out page, it was pre-tested on a reference group.

The questionnaire consisted of three sections. Section one was split into two different sections depending on the mobile netbank usage of the respondent. Users of mobile netbank were asked how long they have used the service and how often. Non-users of mobile netbank were asked about the main reason for not using the service as well as about their intention to take the service into use. Section two solicited respondents' views of their feelings toward the mobile netbank service and the adoption process of mobile netbank. The section contained altogether 46 claims divided on five pages. Section three gathered demographic information about respondents' gender, age, education level, household income, occupation, and line of business as well as mobile phone information and Internet usage information in general.

6.4 Method of analysis

In accordance with the methodological approach, the quantitative data was statistically analyzed using the Microsoft Excel and SPSS for Windows programs. Applying the regression analysis in investigating factors influencing certain behavior of consumers follows the research path chosen, for example, by Bruner II and Kumar (2005), Davis (1989), and Venkatesh and Davis (2000), as well as Waite and Harrison (2002). The purpose of the scale obtained through factor analysis is to explain and predict the formation of behavioral adoption intention. To validate the scale, the association between factor scores as independent variables and the behavioral intention reported by the participants as the dependent variable was tested. Whether the explanatory variables in the

research model had an effect on the dependent variable was tested with ANOVA adopted and modified from Bruner II and Kumar (2005). Reliability analysis was conducted and the Cronbach's alpha scores indicated adequate reliability levels.

In addition to the factoring, further descriptive findings were analyzed to provide better understanding of customers' attitudes to various characteristics and perceived barriers of mobile netbank. The formed dimensions were analyzed and tested with T-tests, χ^2 tests and crosstabulations to identify if the segments differed in demographics and how. These analysis methods were chosen because they were considered adequate for the purpose of the study. They require a comparison of the combined variables with an appropriate factor and, in this case, the most determining, logical and practical factor is usage experience or its absence since it can be assumed that the resistance can be influenced by it. Thus, the basic idea of these analyses is to find out the intensity and tendency of each barrier among users and non-users of mobile netbank.⁴

6.5 Reliability and validity

Four tests have commonly been used to establish the quality of any empirical social research (Yin 2002). Construct validity concerns establishing correct operational measures for the concepts being studied. Internal validity concerns establishing causal relationships in explanatory or causal studies. External validity means the establishment of the domain in which a study's findings can be generalized, and finally, reliability means demonstrating that the operations of a study can be repeated with the same results. That is, reliability concerns the accuracy and precision of the measurement procedure. It refers to the degree to which a measure is free of variable error and to the accuracy, consistency and reproducibility of a measuring instrument.

Reliability describes consistency. Reliability estimates tell whether the outcomes will remain stable over time. As mentioned, the most common type of reliability measurement evaluates the internal consistency, which is concerned with the homogeneity of items comprising a scale. (DeVellis 1991) The scales used in this study in order to measure perceived beliefs of innovation attributes and barriers were based on previous research by Bruner II and Kumar (2005) and on their existing

⁴ Anonyymi. Ei päiväystä. *Menetelmäopetuksen valtakunnallinen tietovaranto*. [WWW-document]. <<http://www.fsd.uta.fi/menetelmaopetus/index.html>>. Read 27.4.2007.

scales. Moreover, previous research suggests that the five-point bipolar scales used in the semantic differential have relatively high reliabilities.

Internal consistency is typically determined through a statistical examination of the results obtained, equated with Cronbach's coefficient alpha (DeVellis 1991). Thus, the present study uses Cronbach's alpha to determine the reliability of the scales and the results. According to Alkula et al. (2002), the alpha of a scale should be greater than 0.70 for items that are to be used together as a scale. In the present study Cronbach's alpha of all the items presented was over 0.80, which is considered acceptable. Other means to improve the reliability of results, such as phrasing the measuring statements unambiguously, determining the number of statements carefully, and providing clear instructions for questions, were taken into consideration in designing the questionnaire as well.

Validity refers to the extent to which a survey measures what it is supposed to measure. Internal validity refers to the results of the study being a consequence of the studied phenomena. That is, the extent to which one can say the independent variables cause the effects of the dependent variables. External validity refers to the possibilities for generalizing the results to other situations, groups or investigations. (Alkula et al. 2002) Internal validity has been enhanced in the present study by a careful review of relevant literature and use of the original scales of the main theory by Bruner II and Kumar (2005). In addition, other methods to increase the internal validity were used, such as randomization of statement order. The external validity can be considered to be high as a result of the large sample size across several strata (e.g., age, socioeconomic status, and occupation).

Content validity concerns item sampling adequacy. That is, the extent to which a specific set of items reflects a content domain. In behavioral research, when one is measuring attributes, such as beliefs and attitudes, the issue of content validity is more subtle, since it is difficult to determine exactly what the range of potential items is. (Yin 2002) In the present content, as mentioned also before, the statements used in the survey were copied from a previous study by Bruner II and Kumar (2005). In addition, the items were viewed and judged by colleagues familiar with the context of the study. Some expert interviews were made to assess the operationalisation of the hypotheses and the theory behind them. Moreover, the translation of the statements to local language was viewed by the language experts.

Construct validity is referred to as the degree to which the scores achieved by a measure perform as they should, according to a substantive theory postulate. That is, the theoretical relationship of a variable with respect to other variables is observed. It is used to estimate how well the instrument is measuring the underlying construct it is attempting to measure. Methods for achieving this kind of validations include factor analysis and multimethod analysis. (Alkula et al. 2002) These were used in this study as well.

7 RESEARCH FINDINGS

7.1 Review of the survey data

The questionnaire was placed on the log-out site of Nordea's online service and a sample of 651 electronic netbank users was received. The sample was further divided into three usage segments depending on the participant's usage experience of the mobile netbank service. Thus, the segments were labeled as users, experimentalists and non-users of mobile netbank. The normal distribution of the survey data as well as possible outliers of the responses were examined before further the analyses were conducted.

The greatest number of responses of the received 651 came from the group of non-users. All in all, there were 422 responses (64.8%) from non-users, 88 responses (13.5%) from experimentalists and 141 responses (21.7%) from users. One of the major interests in the survey was to study the differences between the users and current non-users of mobile netbank, and this was made possible by the sample method employed.

Figure 10 depicts the age distribution of each mobile netbank usage segment. As can be seen from the figure, the distribution is fairly different between the segments. Most of the users of mobile netbank are 31–40 years old (24%), where as most of the non-users of the service are over 51 years old (24%). Most of the experimentalists of mobile netbank are 21–30 years old (33%). For some reason, 189 respondents of the non-user segment did not give their age at all.

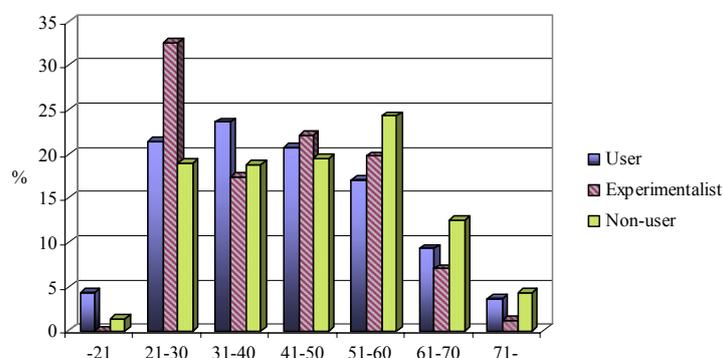


Figure 10: Age distributions of mobile netbank usage segments

Over half of the respondents of the survey were female (59%) and 41 percent male. Figure 11 presents the gender distribution of the usage segments. Of all the respondents of the survey, 11% of men and 11% of women fell into the user segment. 8% of men reported to belong into the experimentalist segment, the corresponding percentage with women being 6, which was, thus, slightly lower than with men. However, 42% of all female respondents and slightly over 22% of all male respondents reported to belong into the non-user segment. A statistically significant correlation (χ^2 -test) was found between the gender and the use of the mobile netbank service ($p < 0.005$). That is, the gender can be seen to affect the use of the mobile netbank service. Furthermore, it can be seen that in the user segment there were 50 percent female and 50 percent male. In the experimentalist segment there were slightly more male than female. In contrast to the non-user segment, in which there were more female than male.

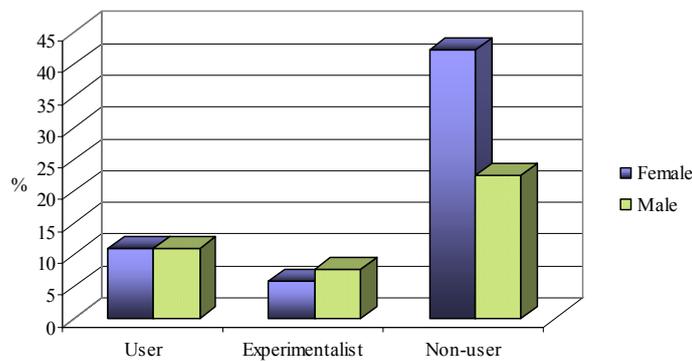


Figure 11: Gender distributions of mobile netbank usage segments

The questionnaire asked about education and field of employment of the respondents. Most of the respondents of the survey reported to have a university education (23%) or a vocational education (21%). This can also be seen in the relative shares of education among the usage segments. In the user group vocational education was the largest category (25%), whereas in the experimentalist segment and in the non-user segment the largest category was university education (28% and 23% respectively). The second largest category was that of vocational education in the non-user (19%) and experimentalist (20%) segments, and university education in the user segment (21%).

The result is consistent with the picture that emerges from Figure 12, which depicts the relative shares of the occupation distribution in the usage segments. Worker was the largest occupational category in the user and experimentalist segments (28% of experimentalists and 30% of users). The largest occupational category in the non-user segment was white-collar workers (24%). Moreover, the second largest category in the user group was white-collar workers (15%) as well as in the

experimentalist segment (24%). Interestingly, 14 percent of the respondents in the user segment were pensioners (3% of all of the respondents of the survey and 18% of the all of the pensioners who responded to the survey).

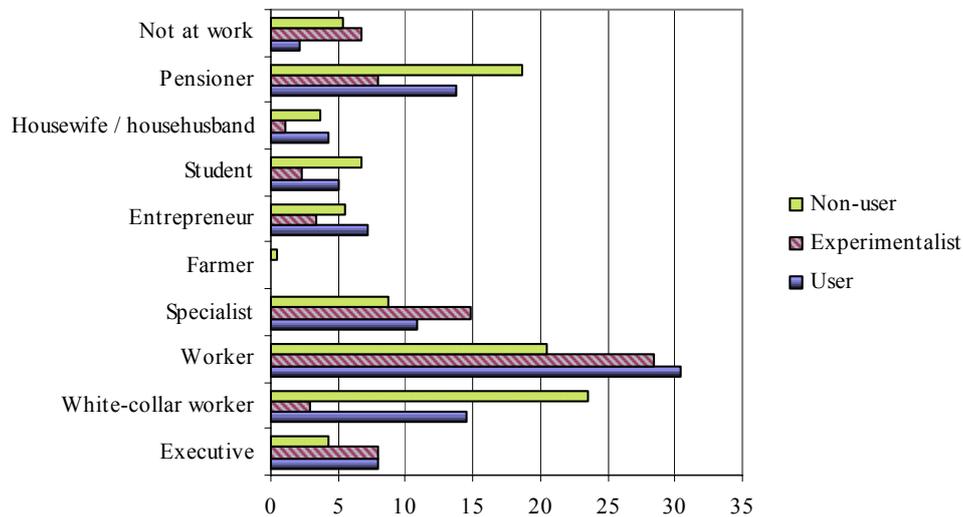


Figure 12: Occupation distribution in the usage segments

Traditionally, the innovators in the use of technological products are often characterized as being at a higher professional and educational level, and it has been found, for example, that non-users and so called late adopters of technological innovations are often pensioners (e.g. Porter & Donthu 2006). However, the results of this study would appear to contradict this characterization. Neither the education nor the occupation of the respondents had a statistically significant correlation with the use of the mobile netbank service ($p > 0.05$). That is, neither the respondent's education nor occupation affects the usage of mobile netbank.

The majority of all the respondents reported to own a basic mobile phone model (61%), and slightly less than 30 percent reported to own a so called smart phone or PDA, which supports the use of mobile netbank the best. Interestingly, most of the users (46%) of mobile netbank reported to own a basic mobile phone. However, 37 percent said to own a so called smart phone. In addition, 12 percent reported to use mobile netbank with a communicator. This distribution of relative shares of mobile phone models within the usage segments is illustrated in Figure 13 below.

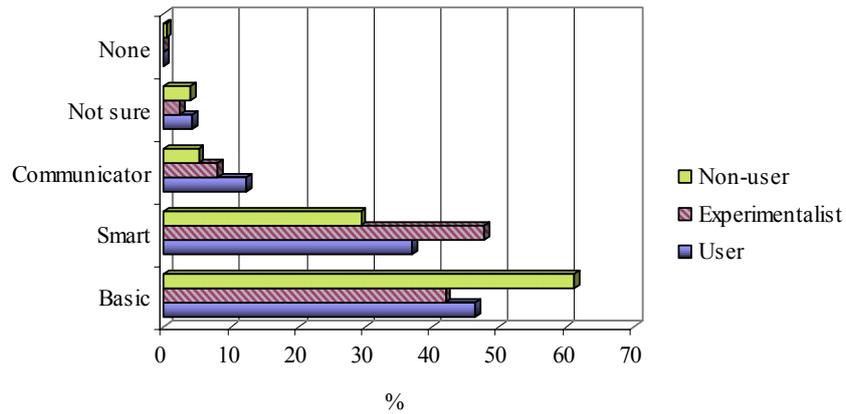


Figure 13: Distribution of mobile phone models within the usage segments

Most of the respondents in the non-user segment (70%) reported to own a basic mobile phone, while 23% reported to own a so called smart phone or PDA. 4 percent of the non-users were not sure of the model of their mobile phone, but only two non-users reported not to have a mobile phone at all. Most of the experimentalists (48%), on the other hand, reported to own a smart phone or PDA, and 42 percent a basic mobile phone. Two of the experimentalists were not sure which mobile phone model they had but all of them reported to own a mobile phone. The dependency between the mobile phone model and the usage of mobile netbank was noticed to be statistically significant ($p < 0.005$). That is, the possession of a suitable mobile phone model increases the probability of using the mobile netbank service. Interestingly, though, many of the users of mobile netbank reported to use the service via a basic mobile phone.

7.1.1 Mobile netbank users

Most of the mobile netbank users had started to use the service more than six months before the survey was conducted. That is, 83 percent of male respondents and 84 percent of female respondents had started to use the service more than 6 months before answering the survey. This is an interesting finding since the new mobile netbank service was launched only less than one year ago as a facelift to the old mobile banking services.

The survey also examined the participants' ways of conducting their banking via mobile netbank. As shown in Figure 14, the majority of the users of the mobile netbank service reported that they conducted banking weekly (49% of female respondents and 58% of male respondents). None of the users of mobile netbank reported to use the service less frequently than once a month.

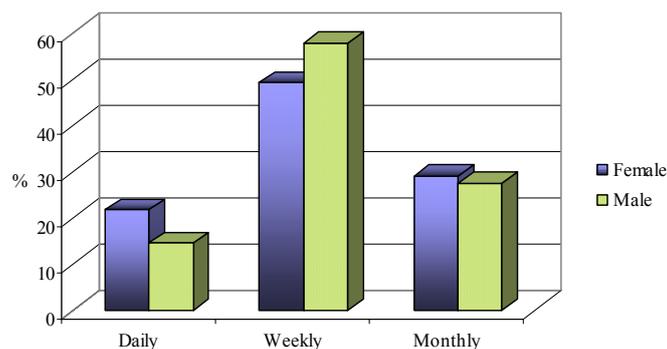


Figure 14: Mobile netbank usage frequency

A statistically significant correlation was found between the use of mobile netbank and the use of electronic netbank via a PC ($p < 0.005$). That is, those who use electronic netbank more often, have a greater likelihood to use mobile netbank more often as well. This is illustrated in Figure 15 below. Most of the mobile netbank users use both electronic netbank via a PC and mobile netbank weekly (42%). Slightly less than 13 percent use electronic netbank weekly and mobile netbank monthly. 19 percent told that they used both mobile netbank and electronic netbank via a PC daily. Interestingly, one user reported to use mobile netbank daily but electronic netbank weekly. In addition, two of the users reported to use mobile netbank weekly but electronic netbank monthly.

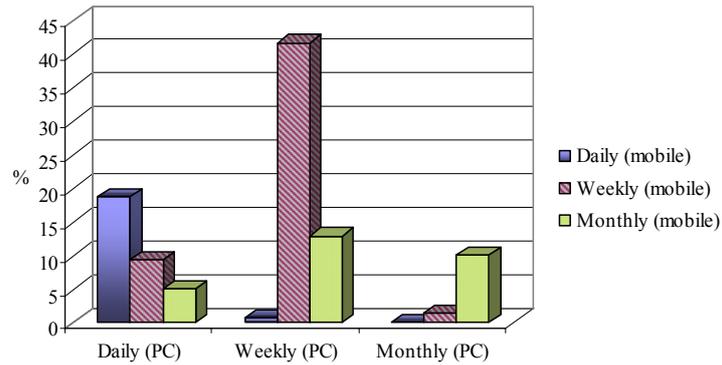


Figure 15: Distribution of electronic netbank and mobile netbank usage

In addition, a statistically significant correlation was found between the respondent's mobile phone model and the usage frequency ($p=0.001$). Consequently, there is an interdependence between the mobile phone model of the service user and the frequency to use the service – if the user has a smart phone, the frequency to use mobile netbank is higher.

Most of the users (31%) reported to own a basic mobile phone and used the mobile netbank service weekly. In addition, 9 percent of the basic mobile phone owners reported to use mobile netbank daily. 17 percent of the users reported to own a smart phone or PDA and used the mobile netbank service weekly. Moreover, slightly less than 14 percent used the service with a smart phone monthly. In addition, more than 7 percent of the users reported to use mobile netbank monthly via a communicator. More than 2 percent of the daily users were not sure what kind of a mobile phone model they had.

In addition, 31 percent of the users used their mobile phone for general Internet surfing weekly. Moreover, almost 60 percent of the user segment respondents reported to use the Internet via a mobile phone every now and then, and in contrast less than 40 percent reported not to use their mobile phone for Internet surfing. Almost all of the users reported to pay their mobile phone bill themselves (78%).

7.1.2 Mobile netbank non-users

Altogether 510 respondents were so called non-users of mobile netbank. The majority of them (422) had not used or even tried the service, but some (88), labeled above as experimentalists, had tried the service once or twice and then made the decision to reject the usage. Both the non-users and experimentalists are examined in this section.

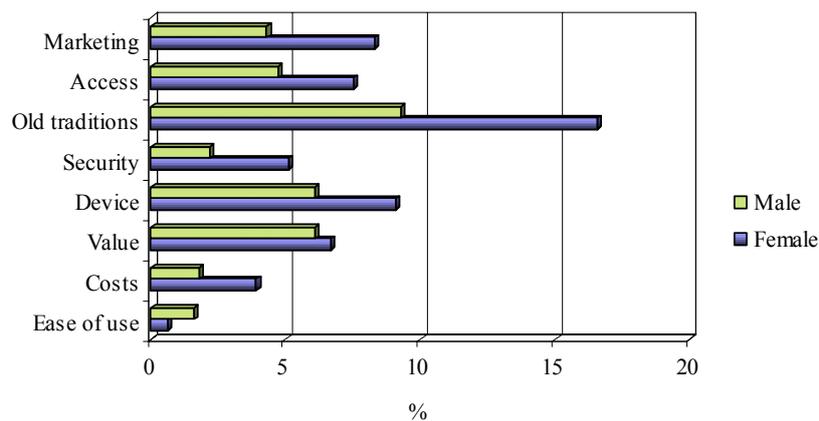


Figure 16: Distribution of the main reason for non-usage

The most common (26%) main reason not to use the mobile netbank service was reported to be old habits to conduct banking, mainly via electronic netbank (see Figure 16 above). Second most common (15%) reason was the opinion that the mobile phone is not a suitable device for banking (labeled as Device in the figure). Perceived value and insufficient marketing of the service received both slightly less than 13 percent of the responses. Some 12 percent reported that their own mobile phone model does not support the usage of the mobile netbank service (labeled Access). More than 7 percent were not sure of the security of the service and slightly less than 6 percent perceived the costs of the service usage too high. Only two percent of the respondents thought the usage of the mobile netbank service to be too difficult and complicated. The differences in the main reasons between female and male respondents were not statistically significant ($p=0.258$).

Moreover, the differences between the main reasons and the behavioral intention to take the service into use had statistically significant correlations ($p<0.005$). Most of the non-users who reported that they would prefer banking as usual mainly via electronic netbank had no intention at all to take mobile netbank into use. However, some intended to take the service into use at a later date. In addition, most of those who did not think that a mobile phone is a suitable device to conduct

banking had no intention to take the service into use. In the non-user category in which perceived value was the main reason to reject, most of the respondents were planning to take the service into use some day. Moreover, the same pattern could be seen in the case of insufficient marketing, Most of the respondents who were unsure of the security of the service intended to take mobile netbank into use at a later date or not at all. Most of those who reported the costs to be too high intended to take the service into use at a later date.

The behavioral intention to take the service into use is presented in Figure 17 below. Altogether, slightly over 42 percent of the non-users and experimentalists intended to take the service into use some day. Correlation between the respondents' gender and behavioral intention was not statistically significant ($p=0.056$). In other words, the respondents' gender and the behavioral intention do not have any bilateral dependency.

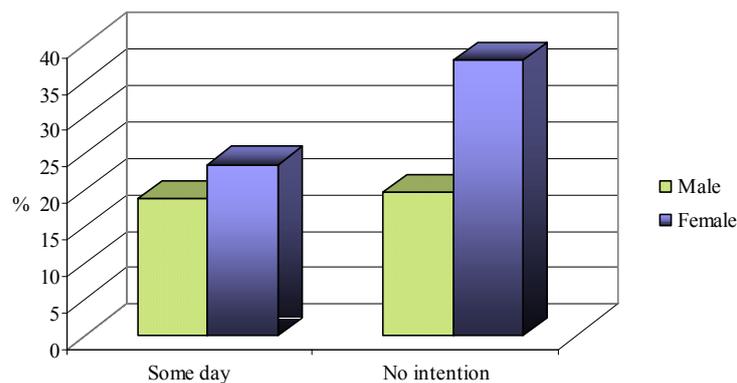


Figure 17: Behavioral intention to take the mobile netbank service into use

However, the correlation between the behavioral intention to take mobile netbank into use and the Internet usage in general via a mobile phone was found statistically significant ($p<0.005$). Those who intended to take mobile netbank into use in the near future reported to use the Internet via a mobile phone as well quite frequently. However, despite the high correlation, in all categories in which respondents reported to take mobile netbank into use at some point, some respondents reported not to use the Internet via a mobile phone. The distribution of the relative shares of the Internet usage via a mobile phone among the non-users and experimentalists is illustrated in Figure 18. Most of the experimentalists (79%) browse the Internet sometimes via a mobile phone. In addition, 28 percent of the non-users use their mobile phone to browse the Internet.

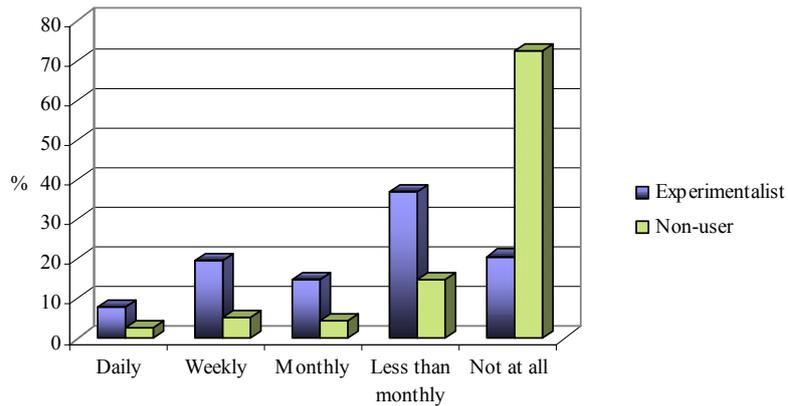


Figure 18: Distribution of Internet usage via a mobile phone

In addition, the correlation between the usage frequency of electronic netbank via a PC and the behavioral intention to take mobile netbank into use was found statistically significant ($p < 0.05$). That is, the frequency to use electronic netbank via a PC can be seen to affect the behavioral intention – the more often one uses electronic netbank, the more positive is the behavioral intention to use mobile netbank. Most of those who intended to take mobile netbank into use at a later date reported to use electronic netbank weekly or daily. None of the respondents who intended to take mobile netbank into use within one year or six months used electronic netbank less frequently than weekly.

It was also discovered that the correlation between the payer of a respondent’s mobile phone bill and the behavioral intention to take the service into use was statistically significant ($p < 0.005$). Most of the respondents (83%), however, reported to pay the mobile phone bill themselves in all behavioral intention categories. The second most general mobile phone bill payer was the employer (12%).

The correlation between the respondents’ occupation and the behavioral intention to take mobile netbank into use was found statistically significant ($p < 0.005$). The most common occupation of the respondents who intended to take the service into use was white-collar worker (10%), worker (7.8%), pensioner (6.4%), or specialist (6.2%).

Besides these, a statistically significant correlation was found to exist between the respondents’ education and the behavioral intention to take mobile netbank into use ($p < 0.005$). Most of the respondents who intended to take mobile netbank into use in the near future had an education from a university (20%) or a vocational (27%) or elementary school (33%). Almost all who intended to

take the service into use within six months had a university education (67%). In addition, those who were planning to take the service into use at a later date than within six months had a university education (58%). Most of the respondents who did not intend to take mobile netbank into use at all reported to have a vocational education.

7.2 Factor analysis

The data was studied with a factor analysis to validate the proposed mobile netbank adoption characteristics originally presented by Bruner II and Kumar (2005). The used c-TAM model included 26 variables in the questionnaire. In addition, five variables of the context of perceived trust were included in the questionnaire.

The data was first screened for inter-variable correlations to judge whether the data justified the application of the factor analysis. A high number of strong inter-variable correlations were observed. Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, as presented in Table 2, were also conducted. These measures suggest that sufficient correlations among the variables existed to warrant a factor analysis. The KMO measure above 0.80 is interpreted as meritorious (Hair Jr., Anderson, Tatham & Black 1998). The Kaiser-Meyer-Olkin measure of sampling adequacy is a statistic that indicates the proportion of variance in the variables that might be caused by underlying factors. The value 0.96 (close to 1.0) indicates that a factor analysis is useful with the data. Bartlett's test of sphericity, on the other hand, tests the hypothesis that the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore unsuitable for structure detection. Small significance level values indicate that a factor analysis may be useful with the data.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.960
Bartlett's Test of Sphericity	Approx. Chi-Square	12244.287
	df	276
	Sig.	0.000

Table 2: KMO and Bartlett's Test

The factor analysis was conducted with SPSS for Windows, release 15.0. Before the factor analysis, the scales of the negative statements were inverted, so that the scales of all statements were comparable; the lower the mean of a statement the higher the resistance. Second, the maximal

likelihood factoring method was applied to examine how well the statements of the original c-TAM model as well as the perceived trust managed to form the dimensions of the adoption. The number of extracted factors was decided based on the latent root and scree test criteria (Hair Jr. et al. 1998). To facilitate the interpretation of the factors, VARIMAX rotation was applied. The rotated component matrix is shown in Appendix 4.

Four factors had eigenvalues over 1 and the fifth close to one (0.726). The fifth factor was not well supported due to the fact that many statements did not group well with other statements to form the dimensions, and it should therefore be considered if some statements should be excluded. After examining the scree plot and the total variance explained, the five factors were, however, chosen for the final analysis as also the framework of the study suggests. Hence, the maximum likelihood method supported the dimensions created from the individual statements originally by Bruner II and Kumar (2005).

The factor analysis suggests that there are five dimensions in the evaluation space of consumers' intentions to use mobile netbank service. Statements about the attitude toward the act grouped well under the attitude component but they grouped also under the perceived fun component. In addition, four statements of perceived usefulness were grouped under the attitude component with relatively high factor scores. This suggests that these statements should be removed from the model analysis. However, the prior literature of c-TAM gives the basis for this survey and therefore no original statements were removed from the analysis, because the theory strongly supports that these statements should be placed under the dimensions originally planned. In addition, because the survey explores subjective perceptions of individuals' opinions, no statements were removed.

The communalities of the factors are presented in Appendix 5. Extraction communalities are estimates of the variance in each variable accounted for by the components. The communalities in this factor analysis are all relatively high, which indicates that the extracted components represent the variables well.

The examination of the factor analysis for the dimensions of mobile netbank adoption suggests that the first factor, which is labeled "Fun", accounts for 22.71 percent of total variance and is defined by five variables with factor loadings. Factor one appears to represent variables that constitute the fun proposition of the mobile banking service. The second factor accounts for 18.43 percent of the total variance and exhibits loadings for five variables that constitute the perceived trust proposition

of mobile netbank. The third factor accounts for 14.81 percent of the total variance and is labeled “Attitude” representing the attitude toward the act proposition with four statements. Factor four labeled as “Usefulness” accounts for 14.39 percent of the total variance and includes five statements of the usefulness and value propositions of mobile netbank. The fifth factor accounts for 1.46 percent the total variance and is labeled “Ease of use” representing variables constituting the usage proposition of mobile banking services. It can be seen in addition from the percentages of total variance that the fifth factor was not well supported due to the fact that many statements did not group well with other statements to form the dimensions, and it should therefore be considered if some statements should be excluded. In this study, the fifth factor was yet forced into the model. Altogether the five variables solution explains over 71.79 percent of the total variability in the original variables. There remains, however, some room for unexplained variation in the analysis.

To verify the reliability of the measurement scales for the proposed factors, Cronbach alpha coefficients were calculated (see Appendix 5). All scales demonstrated values of over 0.80 and clearly exceeded the values (0.70) recommended for field studies (Alkula et al. 2002). The factor scores were saved as regression variables to be used in subsequent tests to explain the mobile netbank adoption dimension.

7.3 Testing the hypotheses

The hypotheses arrived at from theoretical considerations were tested using linear regression analysis. Applying the regression analysis in the investigation of factors influencing certain behavior of consumers follows the research path chosen, for example, by Bruner II and Kumar (2005), Davis (1989) as well as Venkatesh and Davis (2000). The purpose of the scale obtained through the factor analysis is to explain and predict the formation of behavioral adoption intention of mobile netbank. To validate the scale, the association between the factor scores as independent variables and the behavioral intention reported by the participants as the dependent variable was tested. In addition, the hypotheses were tested with other dependent variables according to the framework (e.g. the effect of the perceived usefulness as the independent variable on the attitude toward the act as the dependent variable). Whether the external variables in the research model had an effect on the dependent variable was tested with ANOVA adopted and modified from Bruner II and Kumar (2005).

A full model with all the hypothesized associations and interactions was constructed and the revised model is presented in Chapter 8.2. The results of the regression analyses are presented in Table 3 below.

Hypothesis	β	p	Support
H1	0.760	0.000	Yes
H2	0.533	0.000	No
H3a	0.641	0.000	Yes
H3b	0.584	0.000	Yes
H4	-0.507	0.000	No
H5	0.651	0.000	Yes
H8	0.519	0.000	Yes

Table 3: Results of the regression analyses

The first hypothesis proposed that the perceived usefulness would have a direct and positive influence on the attitude toward the act of adopting mobile netbank. This was the case in the present study and there was seen strong evidence against the null hypothesis ($\beta = 0.760$, $p = 0.000$). However, there was no support for H₂ that the perceived ease of use would only have an indirect effect on the attitude towards the act of adopting mobile netbank, because the direct effect was supported ($\beta = 0.553$, $p = 0.000$). In hypothesis 3a it was firstly predicted that the perceived ease of use would have a direct and positive effect on the perceived usefulness, which was also strongly supported on this survey ($\beta = 0.641$, $p = 0.000$). Secondly (H_{3b}), it was strongly supported that the ease of use would have a direct, positive effect on the perceived fun ($\beta = 0.584$, $p = 0.000$). Hypothesis H₄, concerning the attitude toward the act having a direct, positive influence on the behavioral intention, was, however, not supported ($\beta = -0.507$, $p = 0.000$). The effect seems to be negative according to this study, indicating that the positive attitude does not correlate with behavioral intention to take the service into use.

In consumer contexts, it was also predicted that perceived fun (H₅) in using mobile netbank would have a direct, positive effect on one's attitude toward using it. This hypothesis was strongly supported ($\beta = 0.651$, $p = 0.000$) also in this survey of mobile netbank adoption. In consumer contexts and in the case of a banking service, it was moreover predicted that perceived trust (H₈) in using mobile netbank would have a direct, positive effect on the attitude toward using the service. This hypothesis was supported and strong evidence against the null hypothesis was shown ($\beta = 0.519$, $p = 0.000$).

ANOVA was used to test the effect of the external variables, such as device, style of processing and communication, on the dependent variables. The results of the external variable analyses are presented in Table 4 below. Hypothesis 6 was supported suggesting that the device used to accomplish a task of using mobile netbank has an effect on the perceived ease of use (H_{6a}) associated with the use ($F=4.004$, $p=0.003$) as well as on consumers' perceptions of fun (H_{6b}) associated with using the mobile netbank service ($F=4.0025$ $p=0.003$). In addition, hypothesis concerning communication having an effect on the attitude toward the act (H_{9a}), was strongly supported ($F=5.953$, $p=0.000$) as was the behavioral intention supported as well (H_{9b}) ($F=1.979$, $p=0.004$).

Hypothesis	F	p	Support
H6a	4.004	0.003	Yes
H6b	4.025	0.003	Yes
H9a	5.953	0.000	Yes
H9b	1.979	0.004	Yes
H7a	1.239	0.161	No
H7b	1.249	0.152	No
H7c	1.337	0.094	No
H7d	0.825	0.761	No
H7e	1.262	0.144	No
H7f	1.045	0.403	No

Table 4: Results of the external variables analyses

It was also postulated that the style of processing would have an overall effect on mobile netbank adoption. This hypothesis was not supported. It is not supported that one's style of processing would affect the perceived usefulness ($F=1.2249$, $p=0.152$), perceived ease of use ($F=1.239$, $p=0.161$), attitude toward using the service ($F=0.825$, $p=0.761$), perceived fun using the service ($F=1.337$, $p=0.094$), perceived trust ($F=1.262$, $p=0.144$) or the behavioral intention to adopt the service ($F=1.045$ $p=0.403$). This was also tested with crosstabulations and the usage segments did not have statistically significant differences in their styles of processing ($p>0.05$).

7.4 Descriptive findings and innovation resistance analysis

In addition to the factoring, further descriptive findings were analyzed to provide better understanding of customers' attitudes to various characteristics and perceived barriers of mobile netbank. The formed dimensions were analyzed and tested with independent sample T-tests and crosstabulations to identify if the segments differed in demographics and how. These analysis methods were chosen because they were considered adequate for the purpose of the study. They require a comparison of the combined variables with an appropriate factor and, in this case, the most determining and practical factor is usage experience or its absence since it can be assumed that resistance can be influenced by it. Thus, the basic idea of these analyses is to find out the intensity and tendency of each barrier among users and non-users of mobile netbank.

The most essential of statistics concerning the dimensions and the results from the T-test are provided in Table 5. All the negative statements were inverted and, therefore, the lower the mean score of a combined variable, the higher the resistance of that dimension. As the five-point Likert scale was used, the mean scores lower than 3.00 attest the existence of a barrier.

The difference in the mean scores of the users and the experimentalists is significant in the case of perceived usefulness, perceived ease of use, perceived fun, attitude toward the act, and communication and the existence of a barrier was strongly supported ($p < 0.005$). Perceived trust was the only dimension without a statistically significant difference between users and experimentalists ($p > 0.05$). Between the experimentalists and the non-users the difference in the mean scores is statistically significant ($p < 0.005$) in the case of perceived usefulness, perceived ease of use, attitude toward the act, and perceived trust and the existence of a barrier was strongly supported. In addition, the difference was statistically significant ($p < 0.05$) in the case of communication, but just barely statistically significant in perceived fun. Between the users and non-users the differences in the mean scores of the dimensions were all statistically significant ($p < 0.005$).

	N	Mean	Str.Deviation	Sig.T-test		
				U-E	E-N	U-N
Perceived usefulness	632	2.96	1.14	.000	.000	.000
Users	139	3.76	1.10			
Experimentalists	86	3.10	1.01			
Non-Users	407	2.66	1.04			
Perceived ease of use	639	3.04	1.12	.000	.000	.000
Users	140	3.56	1.14			
Experimentalists	87	3.22	1.06			
Non-Users	412	2.83	1.04			
Perceived fun	628	2.59	1.11	.000	.041	.000
Users	139	3.37	1.15			
Experimentalists	85	2.58	0.99			
Non-Users	404	2.33	0.99			
Attitude toward the act	641	3.22	1.34	.000	.000	.000
Users	140	4.53	0.87			
Experimentalists	87	3.37	1.11			
Non-Users	414	2.76	1.21			
Perceived trust	628	2.82	1.27	.274	.000	.000
Users	138	3.41	1.26			
Experimentalists	86	3.25	1.26			
Non-Users	404	2.52	1.18			
Communication	638	2.70	1.11	.000	.004	.000
Users	140	3.27	1.10			
Experimentalists	86	2.75	0.99			
Non-Users	412	2.50	1.07			

Table 5: Descriptive statistics and results from T-test of adoption dimensions

As Table 5 indicates, the mean scores of perceived usefulness, perceived ease of use, perceived fun, attitude toward the act, perceived trust and communication are lower than 3.00 among the non-users. That is, all the dimensions can be seen to create some resistance among non-users of mobile netbank. In the case of the experimentalists the mean scores of communication and perceived fun are below 3.00. Moreover, in the case of the users, none of the mean scores are less than 3.00. Therefore, based on the results of this analysis, usage experience clearly has an influence on the resistance of mobile netbank adoption.

It seems that the users do not have any barriers to mobile netbank adoption at all, whereas the most intense barrier among the experimentalists is the perceived fun. In addition, among the non-users the most intense barrier of adoption is clearly the perceived fun. Also communication is a clear barrier among the non-users. However, the weakest barrier among the non-users is the perceived ease of use. That is, the perceived ease of use does not create as much resistance as the other

barriers do.

Among the non-users and experimentalists the fun of using mobile netbank was perceived to be the biggest adoption barrier. The statements of the perceived fun received a mean of 2.58 among the experimentalists and as low as 2.33 among the non-users. The lowest mean (3.27) of the mobile netbank users was in the case of communication. The greatest standard deviation (1.26) among the users was in the case of the perceived trust although the mean received the relatively high score of 3.41. The lowest standard deviation (0.87) among the users was in the case of the attitude toward the act, which in addition was scored with the highest mean (4.53). The highest mean among the non-users (2.83) was awarded to the perceived ease of use with a relatively low standard deviation (1.04). Among the experimentalists the highest score (3.37) was given to the attitude toward the act with standard deviation of 1.11.

The following table (Table 6) presents the adoption dimensions and resistance barriers in the order of their intensity in all three groups. The table also provides information on the effect of usage experience on the intensity of the dimensions. The non-users and the experimentalists of mobile netbank are presented as one segment of ‘non-users’.

Non-Users		Users		Difference	
Fun	2.373	Communication	3.269	Ease of Use	0.661
Communication	2.544	Fun	3.373	Communication	0.725
Trust	2.651	Trust	3.415	Trust	0.764
Usefulness	2.739	Ease of Use	3.560	Fun	1.000
Attitude	2.864	Usefulness	3.759	Usefulness	1.020
Ease of Use	2.899	Attitude	4.526	Attitude	1.662

Table 6: Intensity of dimensions between non-users and users

The barriers, which are the most intense among the non-users, namely perceived fun, communication and perceived trust, are the ones on which usage does not have a strong effect in terms of intensity. The users of mobile netbank also perceive these barriers as the most intense ones although the mean has increased over 3.00 and the dimensions are no longer perceived as barriers. The perceived ease of use and attitude toward the act do not cause as intense resistance among the non-users. The means are, however, below 3.00 in both cases. The barrier of the perceived ease of use is the fourth intense resistance creator among the mobile netbank users, but interestingly among the non-users it was found to create the least resistance. Still, the difference between the means of these two groups was smallest in the case of the perceived ease of use. The largest difference

between the means of these two groups was in the case of the attitude toward the act of using mobile netbank. Among the users of the service the mean was more than 4.50 whereas among the non-users the mean was found lower than 2.90.

A table of the individual statements that form innovation resistance is provided in Appendix 6. The difference between the users and the non-users is statistically significant in all of the statements and strong evidence of barriers is identified ($p < 0.005$). The statement of the perceived usefulness claiming that mobile netbank helps one to be more productive received the lowest mean among all the respondent groups (users 3.25, experimentalists 2.50 and non-users 2.35). Among the experimentalists the statement received in addition the lowest standard deviation (0.91) of the statements of the perceived usefulness. The users of mobile netbank ranked the statement claiming that using mobile netbank helps them to save time with the highest mean of 4.13 with lowest standard deviation 1.02. The claim that mobile netbank is perceived as a good additional service to netbank via PC was marked with the highest mean among the experimentalists (3.79) and the non-users (3.20). The highest standard deviation (1.24) among the users of mobile netbank was in the case of the costs of using of mobile netbank.

The statements of the perceived ease of use received all in all a mean of 3.04 among all respondents. The inverted statement indicating the difficulties emerging from the smallish screen of mobile phones received the lowest mean among the users (2.91) and the experimentalists (2.67). This suggests that the limited screen size creates some resistance also after the usage experience. The experimentalists thought also that the use of a mobile phone to log into the service would make the log-in process easier (mean 3.56 and standard deviation 0.99). This statement received relatively high means also among the users (3.51) and the non-users (3.24). The greatest standard deviation among the experimentalists (1.30) as well as the non-users (1.25) received the statement of different mobile services and if it is clear which one suits the respondent's mobile phone the best. Hence, the non-users gave the statement the lowest mean (2.23) of the perceived ease of use statements. In addition, among the experimentalists (mean 2.91) and the non-users (mean 2.55) it was perceived that the instructions of the use of mobile netbank were not easy to find. Moreover, the non-users felt that test access codes received from the bank would make the testing of mobile netbank more pleasant (mean 3.29).

The dimension of the perceived fun, that was before seen above to create the most intense resistance, received relatively low mean scores among all usage segments. The lowest mean was

given to the statement claiming the use of mobile netbank is pleasant. In addition, the standard deviation was relatively low. However, the users of mobile netbank saw the use of the service to be fun (3.64); moreover, the non-users gave the statement in question the highest score (mean 2.47).

The second most important source of resistance was communication regarding the mobile netbank service. In general, the respondents were not satisfied with communication (mean 2.70). The users saw that the service was not advertised visibly (mean 2.70), and that information about the use of the service could not be found easily (mean 3.16). In addition, both the experimentalists and the non-users gave the lowest means to the statement of visible advertising. Moreover, they did not think that information on the usage of the service was easy to find or that there was sufficiently information about mobile netbank. Communication can, therefore, be seen to create great resistance among the consumers.

The standard deviations of the perceived trust statements were relatively high among the users of mobile netbank. The strongest trust (3.59) was reported on the service itself and on the trust that others cannot see any personal information or get to use one's accounts while using mobile netbank. The statements of the perceived trust in mobile phones received surprisingly low means among the users of mobile netbank as well as among the other usage segments. The lowest mean (3.26) among the users was in the case of the trust in mobile phones when using them for bank services like mobile netbank. Secondly, the trust in that only the owner of a mobile phone can use mobile netbank with the phone even if it was lost or stolen received a relatively low mean (3.27) among the users of the service. The statements regarding the perceived trust among the users are still not seen as innovation resistance creators.

In addition, the experimentalists did not think the perceived trust as an adoption barrier but the means of the statements were, nevertheless, relatively low. The lowest mean (3.19) was in the case of banking with mobile netbank and its security in general. In addition, the experimentalists were not sure if operators' networks are trustworthy for using mobile netbank (mean 3.22). Also among the non-users there was least trust on mobile banking in general being safe (mean 2.51). The statement in which the non-users seemed to trust the most (mean 2.63) was that others cannot see any personal information or get to use their accounts while they are using mobile netbank. The construct of the perceived trust was however a clear adoption barrier among the non-users all in all.

The attitude toward the use of mobile netbank was relatively positive among the usage segments. The users of mobile netbank thought that mobile netbank is mostly pleasant to use (4.63), a good service (4.57) and also a favorable service (4.51). Moreover, the experimentalists thought that mobile netbank is a good (3.41), favorable (3.38) and positive service (3.37). The experimentalists were not so sure, though, if mobile netbank is a pleasant service to use (3.32). The non-users' opinions did not vary much throughout the statements concerning the attitude. The highest mean (2.88) was given to the claim that the mobile netbank service is pleasant to use. But the lowest mean (2.61) was given to the claim it being a favorable service.

According to these findings the functional barriers seem to be dominant in the case of mobile netbank adoption. Psychological barriers do not reflect, in contrast, as intense resistance among the consumers.

8 CONCLUDING DISCUSSION

8.1 Dimensions of a consumer's adoption process

As part of its primary academic goal, this chapter sets out a model which responds to the initial question raised in the study: *What dimensions affect a consumer's adoption process of mobile netbank?* In doing so, it draws on the theoretical as well as the practical contributions of the study; it also makes use of the answers to the research questions that were discussed in the Introduction chapter of this report.

First, the mobile netbank characteristics as dimensions are discussed as it was addressed in the first subordinate question. Secondly, the perceived barriers of mobile netbank adoption process are concluded and the second subordinate question is answered. Thereafter, the revised framework of the dimensions of the adoption process of mobile netbank is presented. In the end, both theoretical and practical contributions are discussed as well as the future research possibilities.

8.1.1 Innovation attributes as dimensions of mobile netbank adoption

Findings of the study support the existence of a hedonic dimension together with the utilitarian aspect in mobile netbank adoption, as Bruner II and Kumar (2005) proposed in their c-TAM theory. First, the dimension of increase in task performance and efficiency, which is captured by the perceived usefulness construct, has been found to affect the adoption of a variety of technologies (Bruner II & Kumar 2005; Davis 1989; Taylor & Todd 1995), and was a significant determinant for mobile netbank adoption as well. Second, the results provided support for the existence of a perceived fun related dimension. The findings suggest that services that are more fun to use provide a greater sense of positive attitude toward the use of the service.

Perceived ease of use was found to have a direct, positive effect on the attitude toward the use of the service, and it was supported that ease of use has a direct effect on perceived usefulness and fun. These findings suggest that systems that are easy to use will be perceived as more fun to use. Consumers are then likely to derive greater enjoyment and have more fun doing a given task on a system. This supports the findings of Bruner II and Kumar (2005) with their c-TAM that is

augmented with the hedonic factor. But the perceived ease of use, however, also seems to affect directly the attitude toward the act in contrast to Bruner II and Kumar's (2005) findings.

The trust factor, i.e. consumer trust in other parties and trust in technology as well as trust in the service itself, was a significant dimension of mobile netbank adoption. Yet the significant effect of the perceived trust on the adoption of mobile netbank appears to indicate that the users are in fact concerned about the security of conducting banking via a wireless channel, measured in terms of overall security and trustworthiness of the services offered as well as the device and networks used.

As external variables, the mobile device accessing the service, and communication were analyzed and statistically supported. The mobile device has an effect on the consumer perceptions of fun associated with the service. It seems that users will look at mobile netbank more positively if they are accustomed to the mobile phone they are using and if they are using the mobile banking service most suitable for them. This is a crucial finding and brings out the need to inform the consumers of the different kinds of mobile banking services that can be used with different kinds of mobile phones. Although all the mobile banking services may be accessed with different kinds of mobile phones, certain services are more suitable for certain phones (e.g. mobile netbank for smart phones).

In addition, it was found that communication has an effect on both the attitude toward the act and the behavioral intention. Communication may therefore be seen to affect the whole adoption process from the knowledge stage to the decision if to adopt or reject the service as well as to the implementation of the adoption decision, as Rogers (2003) proposed in his innovation diffusion theory and the adoption process point of view. Consumers seek information to cross the feelings of uncertainty also after the implementation stage in the confirmation stage. With the right kind of communication, i.e. informative, clear, trustworthy and attractive communication, the needed information can be delivered to the consumers through the whole adoption process.

It was also suggested by Bruner II and Kumar (2005) that the style of processing would be a significant adoption determinant. In the case of the mobile netbank service, this was not supported. Therefore, it cannot be said that consumers who are predisposed towards visual mode processing will have better attitudes and reactions than those with low visual orientations when they use devices to access mobile netbank and perform tasks. The style of processing was not seen as significantly different among the usage segments.

8.1.2 Perceived barriers as dimensions of mobile netbank adoption

All the dimensions of mobile netbank adoption can be seen to create some innovation resistance among the non-users of mobile netbank. Among the experimentalists the perceived fun and communication as external variables are the only dimensions that may be seen as adoption barriers of mobile netbank. On the other hand, there exists no resistance among the users of mobile netbank. Therefore, based on the results of the analysis, usage experience clearly has an influence on the resistance of mobile netbank adoption.

The most intense barriers among the experimentalists and the non-users were the perceived fun and communication. Furthermore, one of the main reasons of the experimentalists and the non-users to reject the adoption was reported to be the insufficient marketing by the bank. The mobile netbank service was not considered exceedingly complicated to use and it was also seen as a good additional service to the electronic netbank via PC. The c-TAM model posited that the ease of use dimension affects the usefulness of a service; in addition, services that are easy to use are also perceived as more fun to use. Keeping in mind also that most of the respondents were not sure what kind of a mobile banking service would be the most suitable one for their mobile phone, and that the mobile device used to conduct banking via mobile netbank had an effect on the perceived fun, the barrier of communication may be a notable one. In this sense, if the mobile netbank service itself and the instructions on how to use the service were communicated more clearly and attractively to the customers, the main barriers of adoption might be at least significantly lowered, if not totally eliminated.

The communication and perceived fun as adoption barriers may be categorized as functional barriers under the usage barriers. These dimensions may not be pure barriers concerning the usage, but especially the perceived fun relates to it. A usage barrier was described previously in this report (in Chapter 4.2) as a performance risk, which is based on consumers' knowledge and cognitive abilities in a certain product domain. When the adoption process is augmented with the hedonic factor in consumer context, the perceived fun more affectively relates to the performance. Although the dominant limitations concerning the usage of mobile services are traditionally device based, these did not seem to be as crucial in the case of mobile netbank.

One construct of the value barrier is the costs of the usage of the service. In this study the costs of the use of mobile netbank were seen to create some resistance among all the usage segments. The

value barrier was, in other words, relatively low among the usage segments. Most of the respondents saw mobile netbank as value adding and a good service. It was also seen to help to save some time and also be more effective. As Nordea does not charge any additional commissions on the usage of mobile netbank, it can, once again, be seen as a clear communication issue to tell the customers the real costs of the usage. When the value barrier is otherwise relatively low, the costs of the mobile netbank service should be clearly communicated to bring out the fact that the service is part of the whole service package of the customer.

The third functional barrier presented earlier was the risk barrier. In this study, the concept of perceived trust may be seen as causing some uncertainty among all the usage segments. Although the users of mobile netbank did not see the perceived trust as an adoption barrier, it was still seen as a hindering factor from the value point of view. Especially the trust in mobile phones and operators' networks received relatively low scores among the users. Besides, the experimentalists of mobile netbank also felt some uncertainty about the safety of mobile phones and operators' networks when using mobile netbank. All the usage segments had the highest trust in the fact that others cannot see their information or get to use their accounts while they are using mobile netbank. However, one of the reasons for rejecting the behavioral intention to take mobile netbank into use was reported to be the feeling of uncertainty over the suitability of the operators or mobile phones for banking. Customers who have feelings of uncertainty concerning the risk of the usage try to postpone adopting an innovation until they learn more about it. This is, therefore, something that should be taken into consideration when examining the communication aspect of the service.

The psychological barriers were not dominant in this study. The highest resistance source of the psychological barriers was the tradition barrier. For some of the respondents the main reason to reject the use of mobile netbank, was their preference to conduct banking as they have done before with established traditions. However, the tradition barrier was not widely supported among the non-users. In addition, the attitude toward the act of using mobile netbank, was found relatively positive, although some resistance did exist. The image barriers, therefore, can be identified, but they are not dominant. This promises well for the service providers. Mobile netbank has been developed to offer added value to the consumers as an additional service among other electronic services. Therefore, it should be more clearly communicated that a service like this exists and its meaning is to give the customer a possibility to conduct banking whenever and wherever needed via his or her mobile phone.

8.2 The revised model

The framework of the study was first outlined in Chapter 5.6. The revised model, illustrated in figure 19, highlights and summarizes the findings and the effects of the dimensions on the adoption of mobile netbank. The results from the hypotheses testing are also presented. The reader will have observed that the dimensions presented were validated as the thesis progressed. The c-TAM model by Bruner II and Kumar (2005) was further justified, except for the dimensions of the attitude toward the act of using the service having a positive effect on the behavioral intention to use the service, and the style of processing overall throughout the model. Moreover, the perceived trust and communication constructs were validated in the case of mobile netbank adoption.

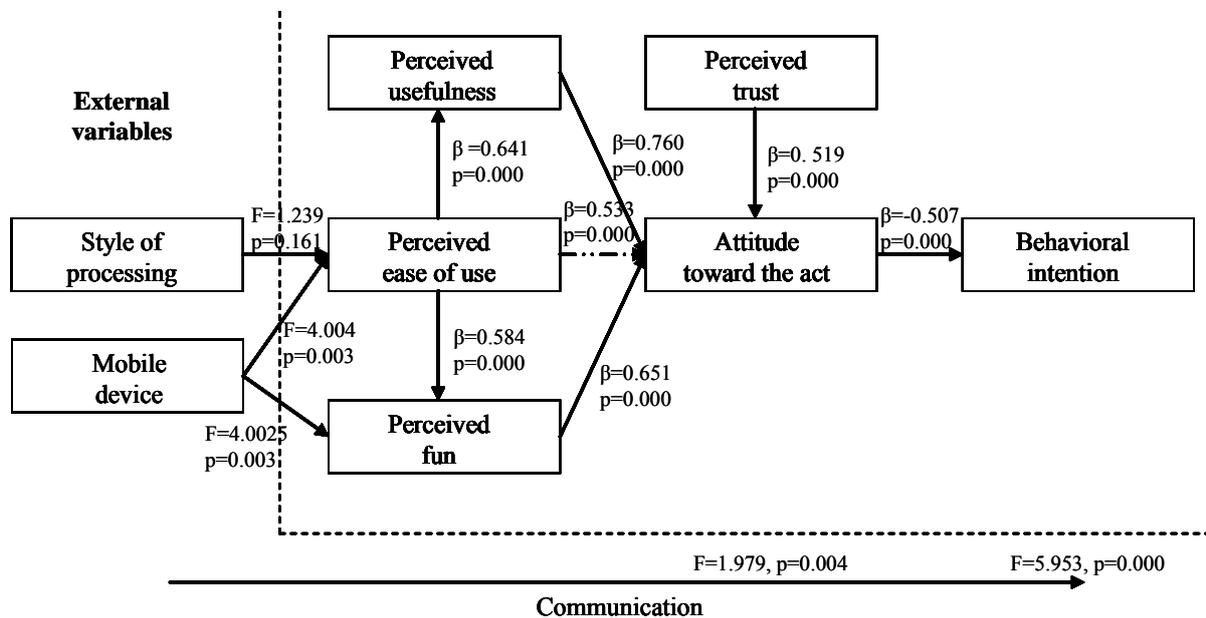


Figure 19: The revised model of mobile netbank adoption

The results suggested that all the other hypothesized effects of the attitudinal measures on behavioral intention received support except the attitude toward the act of adoption intention and the style of processing. That is, although some consumers may have a negative attitude toward the use of mobile netbank they still may intend to take the service into use some day. Furthermore, the study validated that communication has a direct effect on both the attitude and the behavioral intention. Therefore, with clear, informative, attractive and visible communication customers can be persuaded to use the service. The explanatory power of the model is on par with most models presented in consumer inquiry literature.

8.3 Contributions

As it was addressed in Introduction, the success of mobile commerce hinges on consumer willingness to adopt new technology and engage in activities using systems and devices different from what they have used in the past. Therefore, it is essential that the impact of technology-based delivery channels on customer perceptions and behavior is understood, so that the new technology can be successfully integrated into the service delivery platform of mobile banking.

Despite all the possibilities offered by the new electronic channels for banking services, there are various psychological and behavioral issues which appear to influence the acceptance of mobile banking and mobile netbank more specifically. In addition to extending the understanding of consumer behavior in the mobile banking context and innovation adoption from a theoretical stance, the research presented has practical implications for managers who have to make decisions about the new technology-based services in mobile commerce.

8.3.1 Theoretical contributions

The theoretical relationship between perceived attributes and perceived barriers outlined from technology adoption research, were, in fact, rather well supported by the survey findings. In line with previous studies, the present study gave support to Bruner II and Kumar's (2005) model of technology adoption in consumer context as an adequate conceptualization of the adoption behavior in the mobile netbank domain, except for the effect of the individual's style of processing and the negative effect of attitude on behavioural intention. The concept of perceived trust and communication as external variables were added to the model and both of the constructs were supported. Besides, the model used and the results obtained from it yielded some new insights into consumer behavior patterns and the innovation resistance dilemma. For example, the issues of perceived fun, perceived ease of use, and the attitude toward the act are not as straightforward as might have been expected in this domain.

Furthermore, some aspects of the c-TAM model may call for refinement in the case of the mobile banking services like mobile netbank: Firstly, it may be necessary to add some innovation attributes, such as the perceived trust, to the model, as the empirical evidence of this study suggests. Secondly, the ease of use attribute may not be as one-dimensional as viewed by Bruner II and Kumar (2005); by contrast, this study, as well as some previous research (e.g. Davis 1989; Porter &

Donthu 2006), suggests that the perceived ease of use construct might have an extensive influence on the adoption. Furthermore, not all innovation characteristics exert a similar steady influence on the adoption, although this might have been a prior assumption. Besides, the innovation resistance point of view brings out a powerful and competent element into adoption process research.

From the theoretical point of view, the study confirmed that the original models used in adoption research that are mostly based on the TAM theory in an organizational environment by Davis (1989) require a degree of modification and extension but are otherwise suitable in the consumer context as well. Thus, there appears to be a need to develop different versions of adoption models depending on the service studied – models should take the nature of the technology into account. The technology acceptance model in consumer context by Bruner II and Kumar (2005) proved to be a suitable model for identifying the dimensions that affect a consumer's adoption process. But some modification needed to be done in the case of mobile financial services and mobile netbank. Nevertheless, it should not be ignored that Bruner II and Kumar (2005) emphasized the effect of attitude toward the use of a system on the real behavioral intention. However, in this study, the effect was noticed as negative and Bruner II and Kumar's (2005) previous finding was, therefore, not supported. It was noticed that also individuals with a less favorable attitude toward the use of mobile netbank had an intention to take the service into use at some date.

It can be seen that the hedonic factor does affect the adoption in consumer context together with the utilitarian aspect, although the main motivator for banking is not the perceived fun of the service. As Bruner II and Kumar (2005) proposed, the ease of use of the service affects the perceived fun of the use of the service which thereafter affects the attitude of a consumer. This should be taken into consideration in practice as well and enough visible information on the service itself as well as on its use should be given to consumers to enhance the perceived fun with the usage of the service.

In consumer research it is generally believed that past experiences of using a similar technology contribute greatly to favorable attitudes to a new technology, and to the actual adoption of this technology (Dabholkar 1994; Porter & Donthu 2006). The findings in the present study revealed that positive technology perceptions may also enhance the adoption of mobile netbank; nevertheless, the adoption framework that emerged in the context of the study implies that experience with electronic netbank and the Internet in general via a mobile phone encourages the use of mobile netbank. It was also noticed that most of the respondents of the survey in all the usage segments used both electronic netbank via a PC and the Internet via a mobile phone regularly.

Therefore, there is a huge number of potential mobile netbank users if only the service, use of the service, and the value of the usage of the service are communicated clearly and visibly to the consumers.

In terms of advancing theoretical perspectives, the study provides empirical support for a theory of how the dimensions of an innovation, both attributes and barriers, drive the adoption process of new technology-based products. Overall, the conclusions drawn from the results suggest that it is not simply the paradigm of service usefulness and ease of use, but also the typology of the device used and the supporting communication information through the whole process that affect the consumer's adoption decision. Also the usage experience and the frequency of use of the electronic netbank service via a PC and the Internet via a mobile device have an effect on the adoption intention. All of these are critical features of consumer behaviour concerning the technology-based delivery channels that need to be understood in order to integrate a new service into the market successfully. The implications drawn from the findings could help service providers to understand consumers better and to make more consumer-based decisions.

8.3.2 Practical contributions

Identification of the demographic and psychographic profiles of the usage segments provides a number of implications for managers marketing services as well as product managers of mobile banking services. While such information is important in the planning of marketing, it is especially important in developing promotional activities. When innovations are introduced, the message of a new service should reach consumers who are potential service adopters. But knowledge of a new innovation alone is not enough. The communication and marketing plan should support the individual throughout the whole adoption process from the decision making to real implementation and confirmation of a right decision. As it was pointed out earlier in this report (Chapter 3), the individual seeks information throughout the whole adoption process to cross the feelings of uncertainty and the perceived barriers during the process.

The mobile netbank service is at a relatively early stage on the path of diffusion. It is often the case that the first adopters of an innovation are motivated simply by the desire to get their hands on the latest and greatest innovation (e.g. Mattila, Karjaluoto & Pento 2003; Rogers 2003). To achieve the majority of potential mobile netbank users, the innovation resistance has to be eliminated. The usefulness and value specific factors were shown to be relatively low resistance sources and the

demographics of the potential adopters were extremely promising in terms of education, occupation, age, and the mobile phone model the respondents owned as well as the positive attitude toward the act of using mobile netbank.

The perceived trust and security of the service were found to be a source of innovation resistance among the non-users of mobile netbank. However, the perceived barrier was mainly caused by the feeling of uncertainty over mobile phones or operators' networks. The trust in the service itself was, in contrast, seen as creating less resistance. Furthermore, the sense of security of mobile phones created some feelings of uncertainty also among the users of mobile netbank. It is an encouraging thought that even if the perceived trust was found to be a barrier, the wireless service was still viewed as trustworthy since outsiders were not believed to be able to access personal information and accounts while using the service. Moreover, the usage experience was seen to have an effect on the perceived trust dimensions as well lowering the barrier. Hence, the finding of some uncertainty concerning the perceived trust predicts a need for more information about the security, trust and risk issues related to the service. That is, the security of the mobile netbank service should be communicated clearly to the consumers.

The findings of the survey also suggest some product development as well as communication issues hand in hand. From the ease of use point of view, it should be emphasized to consumers that they can use shortcuts inside the mobile netbank service to help their navigation inside the service. But from a product development point of view, it could be investigated how the possibility to build customer's own shortcuts could be realized inside the service. In addition, the possibility to ease the log-in process (e.g. with mobile phones) should be investigated.

The research findings provide some indications as to who could be the next mobile netbank consumers, and what their perceived adoption barriers at the moment might be. These aspects emerge from the questions asked from all three usage groups regarding their usage experience and usage intentions. These aspects can be taken into consideration in the decisions of how the service could reach more users and how the innovation resistance of those users could be reduced. Thus, through well-designed marketing actions marketers are able to reach the huge number of potential adopters of mobile netbank. Thus, the findings of this survey suggest that advertising should concentrate more on informative issues rather than on building brands with less informative advertisements.

8.4 Future research

From the perspective of the technology acceptance model in consumer context, it could be useful to test the framework in a different mobile banking context and find out if it works the same way in order to get more statistical proof. After that, some more comprehensive conclusions could be drawn from the theory and its central framework.

The hedonic aspect of the technological acceptance in consumer context could be further studied in the case of mobile banking and mobile netbank specifically. It could be explored whether the perceived fun of the service is caused because of the user experience and the ease of use of the service or because the use of service is fun.

It could also be studied what kind of marketing plans would support the consumers' adoption process the best so that they could receive the needed information about the innovation attributes and, in contrast, about the adoption barriers. The dimensions of the technology acceptance model in consumer context together with the modified perceived trust and external variables would serve as a good basis for the study. This study did not include other potential variables, such as values and lifestyles, which could have further explained the characteristics of mobile netbank users. Future research could address these issues that are likely to influence consumers' resistance to innovations as well.

Future research could, in addition, identify similar consumer segments on the basis of this study so that marketing managers and service providers could better develop their marketing and tailor it to different consumer segments.

Considering the possibilities in the field of mobile banking, it could be valuable to study the barriers and the resistance causing factors with qualitative methods. In addition, since the functional barriers was the main adoption barrier category and since the functional barriers were emphasized in the model, it could be useful to study the functional barriers in particular, e.g. with some usability experiments.

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APPENDICES

All appendices are confidential until June 2012 and therefore only the headings of the appendices are presented.

Appendix 1: Operationalisation of the variables

Appendix 2: Log off -page of electronic netbank

Appendix 3: Questionnaire

Appendix 4: The rotated factor matrix

Appendix 5: Communalities of factor analysis

Appendix 6: Innovation resistance variables