Factors Influencing Adoption and Diffusion of Mobile Payment Systems – A Holistic Framework

A thesis submitted by **Agnieszka Zmijewska**

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Certificate of Authorship/Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Agnieszka Żmijewska

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Special thanks, of course, to Gerhard for his love and support, giving me so much happiness, always being there for me, making me hundreds of coffees to keep me going during writing, and, last but not least, for making this thesis look as pretty as it does. Also thanks for the support of my family, Mum, Dad, Kasia and Pawel, who have had to listen to me talking about the same topic for the past three years. The same goes to my friends who have been there for me since I started, and understood when I needed 'time off social life' - Dorota, Karolina, Monika, Ola, Romek, Sylwia, and Terka (alphabetically!).

"Being a PhD student is like becoming all of the Seven Dwarfs at once. In the beginning you're Dopey and Bashful. In the middle, you are usually Sneezy, Sleepy, and Grumpy. But at the end, they call you Doc, and then you're Happy!" (Found online at http://www.cs.unc.edu/~azuma/hitch4.html)

Publications supporting this research

The following publications published in peer-reviewed journals and conferences are directly related to this research. The relevance of these papers, as well as of other publications by the author of this thesis, is described in Appendix B.

Dahlberg, T., Mallat, N., Ondrus, J. & **Zmijewska, A.** (2007) 'Mobile Payments: A Review of Past, Present, and Future Research', to appear in the *ECRA (Electronic Commerce Research and Applications) Journal's Special Issue on Mobile Payments*

Dahlberg, T., Mallat, N., Ondrus, J. & **Zmijewska, A.** (2006) 'Mobile Payment Services Market Research - Past, Present and Future', in *Proceedings of the Mobility Roundtable*, Helsinki, Finland, June 2006

Zmijewska, A. & Lawrence, E. (2006) 'Implementation Models in Mobile Payments', in *Proceedings of the IASTED International Conference on Advances in Computer Science and Technology (ACST)*, Puerto Vallarta, Mexico, Jan 2006

Zmijewska, A. & Lawrence, E. (2005) 'Reshaping the Framework for Analysing Success of Mobile Payment Solutions', in *Proceedings of the IADIS International Conference on E-Commerce*, Porto, Portugal, Dec 2005

Zmijewska, A. (2005) 'Evaluating Wireless Technologies in Mobile Payments - A Customer-Centric Approach', in *Proceedings the 4th International Conference on Mobile Business (ICMB)*, Sydney, Australia, July 2005

Pradhan, S., Lawrence, E. & **Zmijewska, A.** (2005) 'Bluetooth as an Enabling Technology in Mobile Transactions', in *Proceedings of the International Conference on Information Technology (ICIT)*, Las Vegas, NV, Nov 2005

Lawrence, E., **Zmijewska, A.** & Pradhan, S. (2005) 'Mobile Payments: Partner or Perish?', in *Proceedings of The Asian Applied Computing Conference (AACC)*, Kathmandu, Nepal, Dec 2005

Zmijewska, A., Lawrence, E. & Steele, R. (2004) 'Towards a Successful Global Payment System in Mobile Commerce', in *Proceedings of the IADIS International Conference on E-Commerce*, Lisbon, Portugal, Dec 2004

Zmijewska, A., Lawrence, E. & Steele, R. (2004) 'Towards Understanding of Factors Influencing User Acceptance of Mobile Payment Systems', in *Proceedings of the IADIS International Conference on WWW/Internet*, Madrid, Spain, October 2004

Zmijewska, A., Lawrence, E. & Steele, R. (2004) 'Classifying M-payments - a User-Centric Model', in *Proceedings of the 3rd International Conference on Mobile Business (ICMB)*, New York, NY, July 2004

Abstract

Mobile devices have a potential to become ideal payment devices because they are small, light, personal, convenient, and many people carry them anytime, anywhere. Mobile devices have a number of connectivity options, and their own display and input capabilities. They are already widely used around the world.

Mobile payments, despite their potential, have not reached the expected adoption levels. While there may be many reasons for this, previous research focused on few topics only, mainly technology and consumers. The main aim of this study was to find out what is necessary to improve adoption and diffusion of mobile payments. Specific objectives that were proposed to help achieve this aim included: a) identifying all the factors that may influence adoption and diffusion of mobile payments, b) integrating such factors and relations between them in a holistic framework, and c) providing specific recommendations and guidelines in all the various perspectives.

Grounded theory was the methodology employed to fulfil these objectives. Qualitative approach was found to be most suitable to this study, and open-ended Web surveys, as well as various kinds of interviews, including email, face-

to-face, phone, and focus groups managed to obtain detailed, in-depth information from industry and user participants.

The main contribution of this study is the holistic theoretical framework that explains the specific factors that influence adoption and diffusion of mobile payments, provides interesting findings on each of the identified factors, and at the same time integrates such investigations together as one coherent whole that forms a roadmap of success factors for mobile payments.

Some of the discovered factors have not been proposed before at all. Some others have been proposed in fragmented explanations that focused on several influences only. Other factors have been proposed before but this study offered more accurate or understandable interpretations or names for them. In addition, this project integrated all the factors together in a holistic framework, pointing out all the important contexts and conditions that providers need to understand and fulfil. Another contribution is a multitude of specific guidelines and recommendations that have been discovered in the participants' data. This study, unlike some other mobile payment projects, additionally devoted much attention to studying mobile payments in relation to other payment methods. The proposed theory with its well explained success factors can be used by providers to improve their current systems or better design new mobile payment initiatives.

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Thesis Structure

This section explains the structure of this thesis. It demonstrates how the chapters are organized, and provides an overview of the whole contents of the thesis.

The thesis starts with an **Introduction**. This chapter explains what is meant by mobile payments, and briefly discusses the features of mobile devices that may be important in terms of their use for payments. It then summarises the previous research on mobile payments in terms of its volume and topics as at the beginning of 2004, which is when this study started; this has revealed research gaps in the field and led to the formation of research questions and objectives that are discussed next. The snapshot of the research trends at the end of 2006 when this study finished is depicted for the sake of comparison. The chapter also discusses the possible impact and significance of this research, as well as the personal motivation of the researcher. The scope of the study is also considered by clarifying the definition of mobile payments that has been adopted in this project. Some background on the topic is also provided, including an overview of existing mobile payment solutions.

The following chapter, **Theoretical Background and Methodology**, examines theoretical assumptions that guide this study, and clarifies how these assumptions have informed the choice of the methodology and research methods. The theoretical background is discussed first, and includes an epistemology (constructionism), and a philosophical stance (interpretivist symbolic interactionism). The chapter then deals with the research methodology on which the whole study is based: grounded theory. Studies that are based on the interpretivist approach tend to use qualitative methods, and therefore the suitability of such methods for this project is explored. The choices debated in this chapter, including a theoretical perspective, methodology, and methods influence the following chapters of the thesis, directly affecting the procedures that deal with quality and rigour, data collection, analysis, reporting, and a review of literature.

The **Rigour and Quality of Research** are dealt with in the subsequent chapter. It was particularly important to the author of this thesis to learn and master rigorous research procedures so that she would be able to carry them into her future research work. Additionally, based on the personal experience of the author, some researchers tend to consider qualitative research as only suitable for exploratory studies; therefore, it was essential to demonstrate that such research can be rigorous, accurate, and just as suitable for generating a theory as quantitative studies. The chapter, therefore, explores quality canons and criteria for qualitative research, and discovers the lack of consensus on the topic in the literature, possibly caused by a dissimilarity of various qualitative methodologies. Therefore, to ensure the rigour and high quality of the studies undertaken for this dissertation, specific techniques that suit the grounded theory methodology are explored and applied.

Although data collection and data analysis in grounded theory research occur simultaneously, they are discussed in two separate chapters for the clarity of explanation. The **Data Collection Principles and Procedures** chapter situates various kinds of open-ended surveys and interviews as the main strategy for collecting data in this study. Subsequently, it explains in detail the sampling process. This includes information on who was interviewed, what kinds of questions were asked, and how the open-ended surveys and the various types of interviews (email, face-to-face, phone, and focus group) fit together in the evolving sampling process that in a grounded theory study is never predetermined, but rather develops during the project. The concept of theoretical saturation is also explained, followed by the description of the way data were stored. Ethical considerations conclude the chapter.

The **Data Analysis Principles and Procedures** chapter commences with the discussion on the basics of a coding process, and proceeds to describe specific coding techniques used in this study and based on the detailed recommendations of the grounded theory authors (Glaser & Strauss, 1967). The grounded theory methodology is distinguished by its very developed and specific coding process; the data analysis chapter explores this process, discussing such concepts as constant comparison method, open versus selective coding, categories, properties, core category, or memos. Both substantive and theoretical coding stages are explained, with a number of relevant examples from the study. The issue of computerization of the data analysis process is also discussed.

The following chapter, **Emerging Theory**, presents the results of the data analysis in the form of an emerging (but not yet final) theory. Firstly, the concepts of theory and theoretical codes are discussed. Afterwards a visual model depicts the theoretical framework of mobile payment success factors identified in the

research; the theory is then described in a narrative structured around the proposed categories and their properties. Numerous representative quotes are used to provide evidence for the emerging theory.

Subsequently, a literature review is used to further refine the theory. This is perhaps unexpected for some researchers who may be used to studying the literature in a substantive area before starting the research. Grounded theory however should never start with a literature review; the **Literature Review: Refining the Theory** chapter explains this postulation in more detail. It also provides a thorough and comprehensive review of existing theories on technological innovations' adoption and diffusion, and on mobile payment success factors proposed by other researchers. The reviewed findings are compared to the emerging theory, and the similarities and differences are highlighted. This forms the basis of the final discussion in the following chapter.

The **Final Discussion** deals with the discrepancies identified in the preceding chapter between the emerging theory and the literature review findings. Such differing factors are analysed by comparing them to the data collected in this study. In some cases this further analysis led to a refinement of the theory; in other instances however the literature review findings were not confirmed in the data. For the latter cases, some possible explanations are proposed as well. The refined visual model of the theoretical framework ends the chapter.

The final chapter, **Conclusions**, summarises, reviews, and concludes the whole study. It discusses the main contributions of this research, relating them to the research questions and objectives stated in the Introduction chapter. It then summarises the main findings, discussing their implications and significance. It

also examines limitations of this study, and proposes future research directions. Finally, it outlines the strengths of this research.

The following figure presents an overview of the thesis structure, and demonstrates the contribution of each chapter, and its relation to other chapters.

Figure 1: Thesis structure

1. Introduction

This chapter begins with the discussion of mobile payments as a field; subsequently it reveals the gaps in the mobile payment literature, and proposes the research questions and objectives for this study. The possible impact and significance of this dissertation are also explored, as is the personal motivation of the researcher. Clarifying the definition of mobile payments helps to limit the scope of the research. An overview of existing mobile payment solutions is also provided to shed more light on the topic.

1.1 Mobile Payments Defined

Mobile payments, or m-payments, are payments for goods and services in which at least one part of the transaction (initiation, authorization, or realization of payment) is conducted using a mobile device (such as a mobile phone, smartphone, or Personal Digital Assistant) and wireless technologies (such as mobile telecommunications networks, or short-range technologies). The mobile device must be highly portable and available for use anytime, anywhere (see Section 1.9 for the origin of this definition).

Some existing mobile payment applications include remote payments, such as for digital content (ring tones, logos, news, or music), concert or flight tickets, parking fees, and transport fares; payments for physical goods are also available, either at vending machines, or manned Point-of-Sale (POS) terminals. Mobile payments form a subset of mobile commerce, which is a broader term including other mobile applications such as mobile marketing, mobile ticketing, mobile banking, mobile games, mobile order tracking, and many others. Mobile payments may be one of the most important building blocks of mobile commerce, as mobile commerce cannot reach its full potential without a way for customers to pay. In order for the mobile commerce to take place anywhere and anytime, the payment method also needs to be wireless and mobile (Coursaris & Hassanein, 2002).

1.2 Mobile Devices as Possible Payment Instruments

Why would a mobile device, and in particular a mobile phone, be considered for use in payments at all? According to MET (2001), the mobile phone is small, personal, familiar, secure, and available at all times. Birch (2002) also observes that a mobile phone is personal, portable, and convenient. Mallat (2004) likewise notes that mobile phones are truly personal, more so than computers at home. Veijalainen et al. (2003) additionally point out that mobile devices are small and light, and almost always carried by their owners. A mobile device also has a sole ownership feature, and often positive emotional connotations.

Furthermore, mobile phones are able to form connections with other devices, mobile networks, and the Internet (Mallat, 2004). Apart from a number of connectivity options, unlike all other payment methods, a mobile device has its own and always available display and input units. In addition, services over a

mobile phone can be customized (based on the user's phone number), and localized (based on the location of the user). Finally, there are over 2.5 billion of mobile phone users in the world nowadays (Taylor, 2006), over a third of the world's population, which means the same number of potential users of mobile payments.

Mobile devices pose challenges, too. According to Henkel (2001), these include the limited reception in some buildings, susceptibility to loss, lack of anonymity, and limited technical flexibility. Mobile phones only work where there is signal, and have limited battery life (Bland, 2003). Dionisio et al. (2001) remind readers that a mobile phone is a limited device in terms of its small size display and limited input capabilities. Another limitation is low memory and computational power (Hort et al., 2002). Schwiderski-Groshe and Knospe (2002) realize that capabilities of various phones differ considerably so end user services must be customized accordingly. In addition, mobile devices are prone to theft and destruction.

To sum up, mobile devices could become suitable payment instruments because they are small, light, and also personal and secure. They are also convenient, and many people have a mobile phone with them anytime, anywhere. Mobile devices have a number of connectivity options, and their own display and input capabilities. They are already widely used around the world, and their use is already familiar to many people. The limitations of mobile devices that need to be taken into account include their small displays, limited input units, and low computational power. They are also very disparate, and susceptible to loss or destruction. They have a limited reception in some places, and restricted battery life.

1.3 Mobile Payment Research Overview

Despite the potential of mobile payments, the uptake so far has been rather disappointing. Mobile payments have not reached the expected adoption levels. There are numerous pilots, with one company often involved in several different initiatives. Many systems have been withdrawn from the market, the most notable cases being Paybox and Simpay. For example, most of the mobile payment services available in European countries and listed in 2002 in the Electronic Payment Systems Observatory (ePSO) database (Carat, 2002) have now been discontinued (Dahlberg et al., 2007).

This obvious gap between what a mobile payment can become and where it is now highlights the importance of research in this area. At the beginning of this thesis project, in early 2004, the researcher set out to investigate what had been the focus of mobile payment studies so far. As strongly recommended in grounded theory, the researcher should not conduct a literature review in the substantive area of research before the study. A detailed explanation of this concept is provided in the Literature Review: Refining the Theory chapter (Chapter 7). It was however necessary to review just general topics studied in mobile payments, to find out the state of the research in this area, identify research gaps that would offer research questions for this study, and to make sure that this project would indeed provide a new and original contribution. The literature search therefore at the beginning of this study, in the first months of 2004, aimed to provide an overview of mobile payment research in terms of its volume and the topics studied. The specific findings were not reviewed, according to the grounded theory requirement.

Various academic databases were used to perform a search for mobile payment publications, and they included ProQuest 5000, IEEE Explore, ACM Digital Library, and Ebsco; the Supersearch tool was used to search a multitude of other databases at once. Numerous publications were found using the Google search engine; Google reveals the titles of publications as well as the names of the databases or conference proceedings to enable the researcher to gain access to the specified papers easily. The author of this thesis also searched for the publications that were referenced in the identified papers (Webster & Watson, 2002). The websites of authors of mobile payment papers were also explored to find out whether they published other relevant publications. The search was considered complete when it was realized that when a new publication would be found, the author of this thesis was familiar with all other mobile payment titles cited in this paper. As another measure, the researcher exchanged the compiled publication list with another mobile payment researcher, and very few additional publications were found. It must be noted that mobile payments formed, at that time, such a new field of study that the researcher did not need to limit search criteria to some databases or conferences but rather aimed at completeness, using the strategies described above.

Because this investigation happened at the beginning of 2004, only papers published up to 2003 could be included. Working papers, white papers and industry reports were excluded since this literature search was concerned with the state of published academic research at that time to discover its gaps.

As Figure 2 on the following page indicates, the first solitary mobile payment publications appeared in 1999, but the field only attracted more interest from 2002 onwards. A growth in the number of conference publications can be seen

especially in 2003. The figure confirms the growing importance of the mobile payment research.

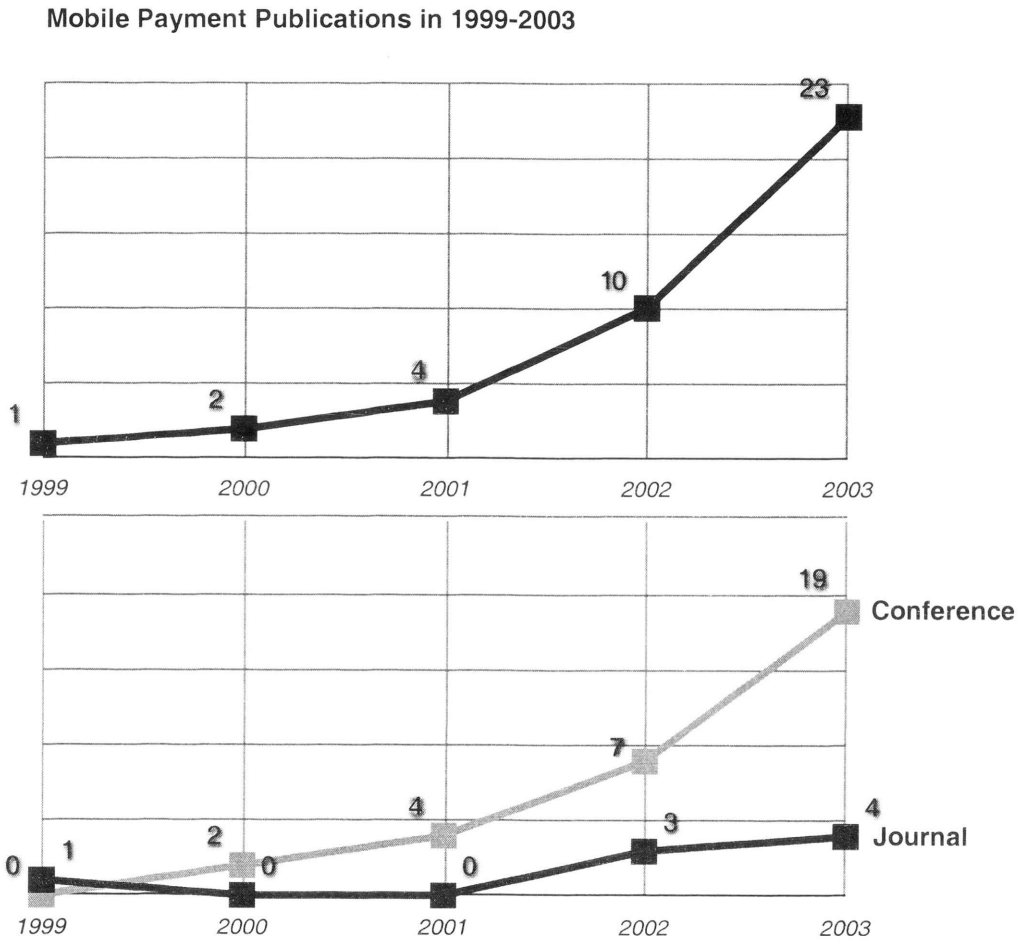


Figure 2: Mobile payment publications up to 2003, both in total, and as they appeared in conferences and journals

There was a very limited number of perspectives on which the identified papers focused. As Figure 3 on the following page indicates, the most popular proved to be technological studies, where various protocols or mechanisms for mobile payments were proposed. There were also some general papers (all conceptual) that would provide an overview of the mobile payment field, characteristics of various mobile payment systems, and similar. The consumer-centric studies

followed; such investigations mostly focused on the consumers' requirements towards mobile payment systems. There was only one study up to 2003 that focused on the requirements of merchants, and one that dealt with mobile payment legal issues. In terms of publication types, journals seemed to publish mostly technology-related mobile payment research and some overviews, but no consumer-related studies.

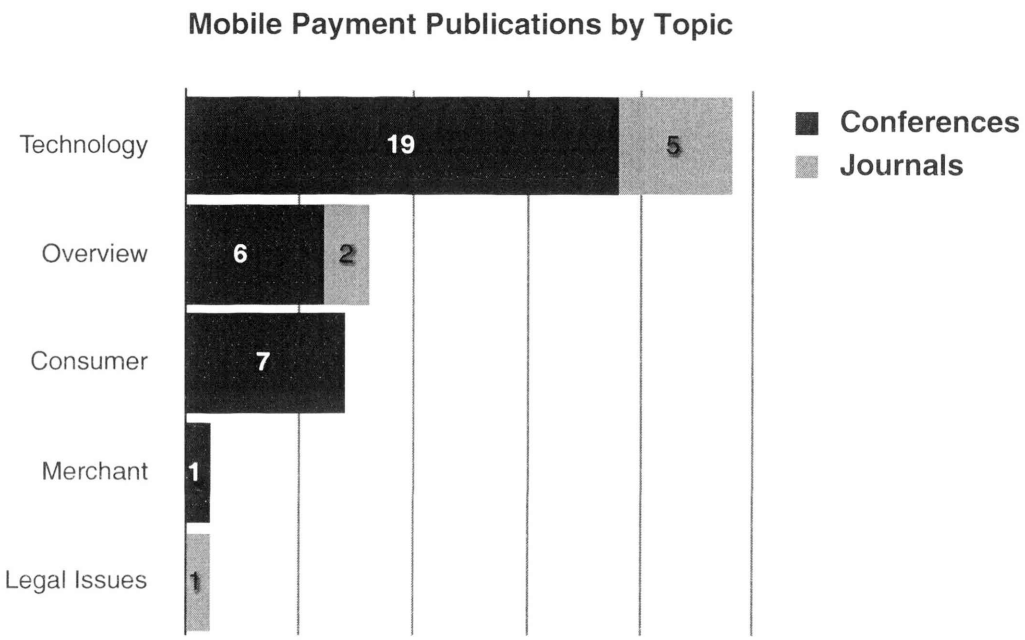


Figure 3: Topics of mobile payment publications up to 2003

Regarding the topics over the years, the number of technology publications was growing steadily, while the growth in consumer-related papers appeared to be similar, but delayed by several years (see Figure 4 below).

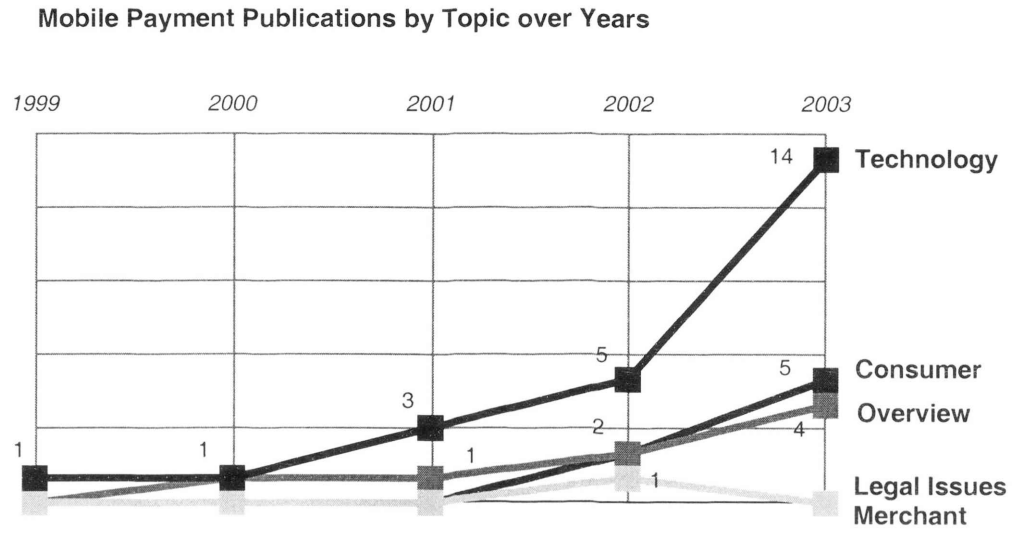


Figure 4: Topics of mobile payment publications over the years

As a reference, Table 1 on the following page provides a list of the authors of the studies included in this research overview.

Technological perspective	Consumer perspective	Overviews, challenges, and characteristics of mobile payments	Merchant perspective
JOURNALS Lam et al (2003) Herzberg (2003) Tewari & O'Mahony (2003) Terziyan (2002) Peirce & O'Mahony (1999) CONFERENCES Antovski & Gusev (2003) Choi & Kim (2003) Dai & Zhang (2003) Kungpisdan et al. (2003a) Kungpisdan et al. (2003b) Me (2003a; 2003b; 2003c) Veijalainen et al. (2003) Vilmos & Karnouskos (2003) Zheng & Chen (2003) Fourati et al. (2002) Knospe & Schwiderski-G. (2002) Kreyer et al. (2002a) Huang & Chen (2002) Bao et al. (2001) Lee et al. (2001a) Mjolsnes & Rong (2001) Dam & Giambiagi (2000)	JOURNALS - CONFERENCES Dahlberg et al. (2003a) Dahlberg et al. (2003b) Lim & Nam (2003) Pousttchi (2003) Pousttchi & Zenker (2003) Dahlberg & Mallat (2002) van der Heijden (2002) [with merchant perspective]	JOURNALS Kreyer et al. (2003) Varshney (2002) CONFERENCES Ding & Hampe (2003a) Ding & Hampe (2003b) Ding & Unnithan (2003) Kreyer et al. (2002b) Wrona et al. (2001) Hampe et al. (2000)	JOURNALS - CONFERENCES van der Heijden (2002) [with consumer perspective] Legal perspective JOURNALS Rawson (2002) CONFERENCES -

Table 1: The authors of mobile payment publications up to 2003

1.4 Research Questions

As the previous sections revealed, mobile devices have a potential to become popular payment devices, yet the adoption has been very slow, and many initiatives failed. It seems that there is much research needed to understand the multitude of success factors in mobile payments. Numerous questions may be posed. What are the barriers to success of mobile payments? What issues need to be addressed before successful initiatives are launched? Why are users not adopting new systems? What would make them accept a new way to pay? What would make merchants adopt a new payment procedure for their customers? Why do new systems fail? How can new systems be implemented to provide most value to each stakeholder, including consumers, merchants, mobile operators, banks, device manufacturers, or third-party providers? Which technologies and implementation models can best fulfil the user's requirements and in what ways, while still providing most value to other stakeholders?

It was also revealed in the previous section that while many such questions may be asked about the reasons for the lack of adoption and diffusion of mobile payments, the previous research focused on a few specific topics, mainly technology and consumers. The former would mainly concern some specific protocols or security tools. Adoption and diffusion of mobile payments were mainly seen as a phenomenon that could be studied through the consumers' perspective only, by identifying consumers' requirements and needs and focusing on individual user's acceptance (see the references in the Consumers' perspective in Table 1 on the preceding page), without exploring numerous other factors that might influence adoption and diffusion.

This has prompted the following research questions that this study will set to answer:

> *What multitude of factors might influence adoption and diffusion of mobile payments, or, in other words, what are the mobile payment success factors? How do such factors relate to each other? What are the specific recommendations and requirements for each of the perspectives?*

These questions underpin the current study, and shape the research aims and objectives described next.

1.5 Aims and Objectives

Based on the research questions identified in the preceding section, the main aim of this study is to find out what is necessary to improve adoption and diffusion of mobile payment systems. *Adoption* refers to the stage in which a technology is selected for use by an individual or an organization. *Diffusion* refers to the stage in which the technology spreads to general use and application (Rogers, 1960). Adoption and diffusion of mobile payments therefore will refer to the state of mobile payments being selected for use by numerous users so that they spread to general use and application, and will become a popular and widely used payment method. It denotes the state when an innovation is adopted and gains acceptance by members of a community (Surry, 1997).

Specific objectives that will help achieve this overall goal include not only identifying all the factors that may improve adoption and diffusion of mobile payments, but also integrating such factors and relations between them in a holistic framework; additionally, specific recommendations and guidelines in all various perspectives will be identified.

Because this study aims to discover as many influential factors as possible and from a multitude of perspectives, the attitudes of various stakeholders will be studied, including industry representatives as well as potential and actual users. A holistic framework will incorporate investigations on various issues that will provide interesting findings on their own, but at the same time will fit together as one coherent whole that will form a comprehensive multi-perspective framework, or a roadmap, of success factors for mobile payments.

1.6 Mobile Payment Research Overview Update

Even though the previous research overview from the beginning of this study (see Section 1.3) was the one that determined the research questions and objectives in this project, and therefore the most important to report, it seems worthwhile to present a brief update on the state of the mobile payment research at the end of 2006 when this project is being finalized. The author of this thesis undertook an extensive literature review on mobile payments at the end of 2006 along with three other researchers who have also studied and published widely in the mobile payment field. This publication will appear in the special issue on Mobile Payments of the Electronic Commerce Research and Applications journal in 2007 (Dahlberg et al., 2007); one figure from this publication is presented here (Figure 5 on the following page) to offer the reader an opportunity to compare the topics up to 2003 revealed in Section 1.3 to the topics up to 2006.

It needs to be noted here that the search process in 2006 followed different criteria, and, instead of aiming at discovering the totality of publications, included only recognized and established conferences; yet, it still seems to provide an interesting point of comparison. The exact methodological procedures of this new project are beyond the scope of this thesis, but can be

found in Dahlberg et al. (2007), including a list of databases and conferences searched.

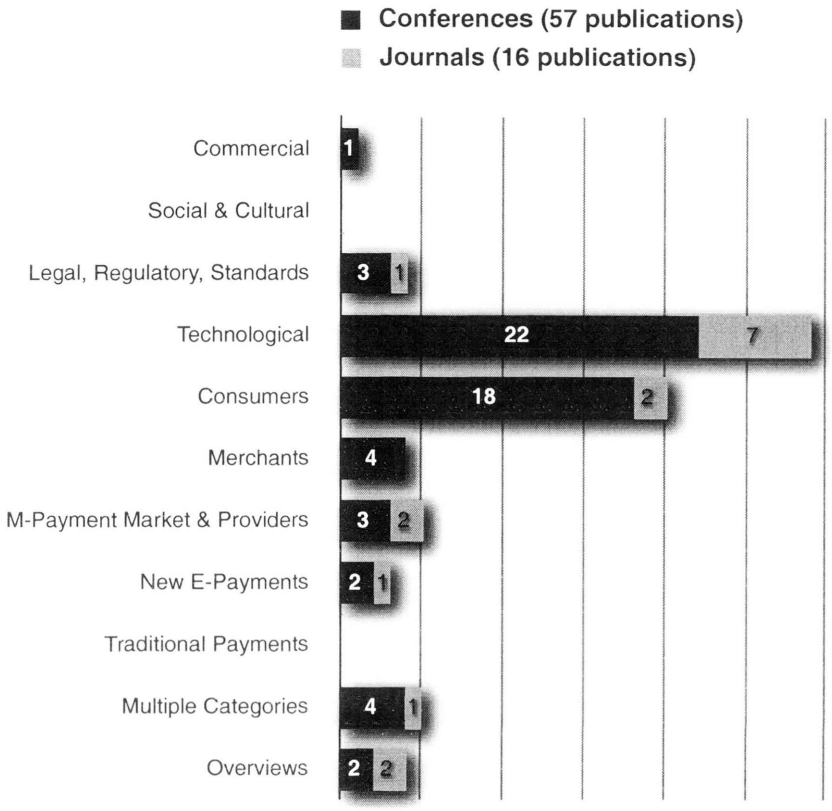


Figure 5: Topics of mobile payment publications up to 2006 (Dahlberg et al, 2007)

It is clearly seen that mobile payment research still mainly focuses on technology and consumers, while a number of other perspectives have only been marginally studied. This confirms that the importance of this doctoral research has not diminished over time.

1.7 Impact and Significance

The conclusions of this research may benefit many people since everyone who is old enough to pay for goods and services is a potential user. Paying for goods and services is an unavoidable part of our everyday lives, and helping to provide a better way to pay would be an important contribution.

The conclusions will be of interest to all stakeholders as well because mobile payments bring new forms of revenue to mobile operators, banks, credit card companies, mobile device manufacturers, and third-party systems providers. According to Smart Card Alliance (2005), a mobile payment application could attract new customers for mobile operators, reduce customer turnover, and add revenues from data services related to payment. Financial service providers could offer new, differentiated payment services to their customers and increase their credit and debit card transaction volume. Merchants can benefit from faster transactions and improved customer convenience.

For the duration of this research, there has been strong interest from the stakeholders when they were contacted for research purposes, which suggests that the results of the studies are important to them. Industry stakeholders have often stayed in contact, and many have asked to receive the conclusions of this study when it is published. Some quotes from such requests may illustrate the interest in this research: "*We would be most interested to see the results of any work on this subject. Of course we have a vested interest in supporting any work that furthers the take-up of these sorts of services, and an obvious interest too in any resultant broadening of the mobile payments market*", or *"We would be delighted to assist where possible, and always willing to support projects that aim to advance use and acceptance of services in this industry."*

Understanding what is going on in the field and discovering success factors will hopefully provide concrete and useful explanations and recommendations to interested stakeholders. As Surry (1997) points out, by better understanding of the multitude of factors that influence adoption of innovations, providers will be better able to explain, predict and accommodate the factors that will facilitate the diffusion of their products. When the providers gain a better understanding of the drivers of adoption, they will be able to proactively design their systems to account for the success factors.

1.8 Personal Motivation

The high potential of mobile payments is confirmed by numerous market reports. Armitt (2004), for example, quotes Arthur D Little's report that predicts that the volume of m-payment transactions, such as using a mobile to pay at vending machines, parking meters, in a shop or over the Internet, will be worth $37.1 billion in 2008.

The topic seemed important enough to undertake a three-year study in the field. The potential of mobile payments, combined with significance and possible impact of this research, has provided a personal motivation. It also seemed an interesting topic as it explores a new dimension of already much researched online payments. There have been enough gaps in existing mobile payment literature to warrant further studies in the field, but at the same time the emerging importance of mobile payments as a research topic is evident. The 2005 International Conference on Mobile Business in Sydney, for example, dedicated several sessions specifically to mobile payments; additionally, the Electronic Commerce Research and Applications journal is issuing a special

edition on mobile payments in 2007. One of the researcher's papers has been accepted for this issue.

Personally, it was also important to the author as a payment is something that affects us unavoidably in our everyday lives, so this research concerns something that is immediate and around us all the time.

1.9 Scope of the Study

Before any further analysis of mobile payments is possible, it is important to understand the scope of this research, and what is included and excluded from this study's definition of mobile payments.

Some researchers focus on the use of a mobile phone in m-payments. According to Krueger (2001a), for example, mobile payments are payments that are carried out via the mobile phone. The same approach is taken by Henkel (2001), who defines an m-payment as a payment method based on the mobile phone. To Poropudas (2002), it is a simple concept - how we can buy and sell goods and services with a mobile phone.

Such definitions do not seem complete since they do not take into account other devices that can be used for mobile payments. Hort et al. (2002) comment that other devices that are often omitted in m-payment definitions are PDAs (Personal Digital Assistants), RFID (Radio-Frequency Identification Tags) key fobs, and smartphones. Ding and Unithan (2003) agree that an m-payment can be made at Point of Sale (POS) through any mobile device, including a mobile phone, a smartphone, or a PDA. The definition provided by whatis.com supports this view: *"M-payment (mobile payment) is a point-of-sale payment made through a*

mobile wireless device, such as a cellular telephone, a smartphone, or a personal digital assistant (PDA)." The Mobile Payment Forum (2002) defines the term as the process of two parties exchanging financial value using a mobile device. Apart from phones and PDAs, such devices could also include wireless tablets and mobile computers. Ondrus (2003) simply defines an m-payment as a payment carried out wirelessly via a mobile device.

If mobile payments can indeed be carried out via various mobile devices, which devices can be classified as mobile? In the opinion of Hort et al. (2002), such a device has to be highly portable, capable of establishing wireless connection, and can be used anytime, anywhere.

Some m-payment definitions do not specify a device to be used, but their focus is on networks that enable such payments. Buhan et al. (2002), after Durlacher, define an m-payment as *"any transaction with a monetary value that is conducted via a mobile telecommunications network."* This view however clearly excludes short-range, or proximity payments via Bluetooth or RFID tags. Hart et al. (2002) believe that mobile payments applying cellular network technology are just one group of m-payments, accompanied by payments applying mobile Internet technology, and those using proximity technologies. The Mobile Payment Forum (2002) also emphasizes the possible use of proximity technologies, not only telecommunications network in mobile payments. Ondrus (2003) not only allows for use of both telecommunication and data communication networks, but he also predicts their convergence in the future.

Apart from devices and networks used in m-payments, some definitions focus on separate stages of a payment process. For Pousttchi (2003), mobile payment is that type of transaction processing where at least the payer employs mobile

communication techniques in conjunction with mobile devices for any of the following processes: initiation, authorization, or realization of payment. For Henkel (2001) it is usually the authorization process that must be performed with a mobile phone, but initiation of transaction could also happen via a phone. Mallat (2004) confirms such views by proposing that at least one part of the transaction must be conducted via a mobile device in mobile payments.

The preceding analysis of mobile payment definitions reveals that this research should focus on mobile payments as payments in which at least one part of the transaction (initiation, authorization, or realization of payment) is conducted using a mobile device (such as a mobile phone, smartphone, or Personal Digital Assistant) through mobile telecommunications network, or short-range wireless technologies. The mobile device must be highly portable and available to use anytime, anywhere. This excludes laptops from the scope of this study that, although portable, are not truly mobile in a sense that they can be carried with the user anytime, anywhere, and be instantly available for use for payments in a shop, on the bus, or at the parking spot.

There is a trend among researchers (for example, Hort et al, 2002; Dionisio et al., 2001) to acknowledge other devices as mobile payment devices, but then to focus their research on mobile phones. This view seems to be justified by the number of mobile phones in use today. Nowadays, there are more than 2.5 billion mobile phone users in the world, and many European countries have reached the saturation point (Taylor, 2006). Throughout this study, when the participants were questioned about their attitudes to mobile devices, they were usually referring to mobile phones in their answers.

1.10 Overview of Existing Mobile Payments

This section provides a brief overview of possible mobile payment solutions. It is included to provide the reader with a better understanding of the studied topic. This paper does not aim to review all possible mobile payment systems' solutions or their characteristics. Rather, it provides a summary to explain the mobile payments concept better, and to make it easier for the reader to relate the theory that will be proposed in this thesis to this mobile application. Some existing systems therefore are depicted in Tables 2 and 3 on the following pages, and represent the various solutions used in mobile payments.

Table 2 focuses on payments that utilize mobile telecommunications networks as the communication medium; such system may rely on voice calls, an exchange of messages, or mobile Internet to conduct the payment. The following Table 3 presents the payments that seemed to attract the most interest in 2006, judging by numerous new pilots and initiatives based on this method. Such payments are based on short-range wireless technologies to transfer data between a phone and the payment terminal. These are also called proximity or contactless payments since a mobile phone needs to be waved close to the terminal, without the need to touch it.

Tables 2 and 3 additionally explain what products/services can be paid for using such systems, and how the payment is charged (for example, from a credit card account or on a mobile phone bill. Both tables have been collated from the following sources: Dennis (2001), Esato (2005), Finextra (2005), Hara (2004), Pastore (2004), Shaw (2004), Williams (2005), as well as, where available, from the official websites of each of the solutions listed.

MOBILE PAYMENTS USING 2G AND 3G MOBILE NETWORKS

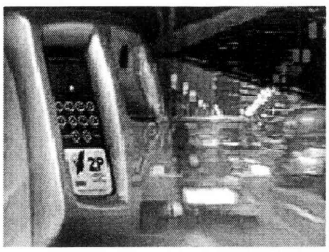
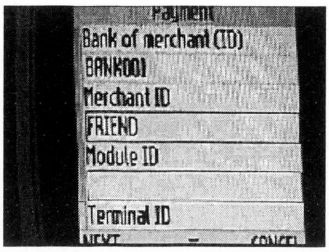
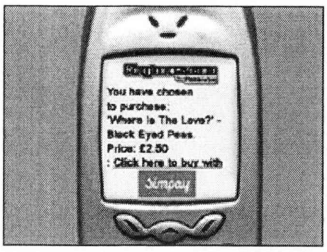
Voice Calls	Messages Sessions	Mobile Internet
		
EXAMPLES ▪ Paybox – Germany, UK, Sweden, Austria **withdrawn 2003 from all except Austria* ▪ mPark – Australia, Ireland, UK, Germany, US	EXAMPLES ▪ Mobipay – Spain ▪ Helsinki City Transport ticket service – Finland	EXAMPLES ▪ Simpay – Europe wide **withdrawn 2005* ▪ payments for iMode content – Japan
PRODUCTS/SERVICES ▪ physical POS ▪ e-commerce POS ▪ vending machines ▪ parking and transport fares	PRODUCTS/SERVICES ▪ physical POS ▪ e-commerce POS ▪ invoices ▪ person-to-person ▪ parking and transport fares	PRODUCTS/SERVICES ▪ digital contents (ring tones, news, music, games)
CHARGE METHOD ▪ from the earlier registered bank account ▪ from the earlier registered credit/debit card	CHARGE METHOD ▪ from the earlier registered credit/debit card	CHARGE METHOD ▪ added to the mobile phone bill ▪ deducted from the pre-paid account

Table 2: Examples of mobile payments based on voice calls, messaging sessions, and mobile Internet over mobile telecommunications networks

MOBILE PAYMENTS USING SHORT-RANGE TECHNOLOGIES		
Near Field Communication	**Infrared**	**Bluetooth**
		
EXAMPLES ▪ MasterCard PayPass – US **trials 2003–2007* ▪ NTT DoCoMo FeliCa – Japan	EXAMPLES ▪ SKT – South Korea ▪ Harex – South Korea	EXAMPLES ▪ Ericsson Eurocard – Sweden **trial only 2001*
PRODUCTS/SERVICES ▪ physical POS ▪ vending machines ▪ parking and transport fares	PRODUCTS/SERVICES ▪ physical POS ▪ vending machines ▪ parking and transport fares	PRODUCTS/SERVICES ▪ physical POS
CHARGE METHOD ▪ from the earlier registered credit card	CHARGE METHOD ▪ from the earlier registered credit card	CHARGE METHOD ▪ from the earlier registered credit card

Table 3: Examples of mobile payments based on short-range wireless technologies, including NFC, Infrared, and Bluetooth

Even though various technologies, scenarios, and products/services have been used in mobile payments, as revealed in Tables 2 and 3, this thesis aims to identify success factors that would not be limited to any specific technology or scenario – rather, by understanding the success factors and requirements first, providers would be able to choose the most suitable technology, payment solution, or charge method to fulfil the necessary requirements.

The details of the technologies that are referred to in Tables 2 and 3 are included in Appendix A. This may be useful for readers who would like more explanations on the 2G and 3G networks, SMS, USSD, mobile Internet, NFC, infrared, or Bluetooth.

1.11 Chapter Review

This chapter explained what is meant by the term mobile payments, and discussed the use of mobile devices as payment instruments. The snapshot of the existing research on mobile payments at the beginning of the study was presented. The literature search revealed that such research focused mainly on two perspectives: technology and consumers; similar results were confirmed at the end of this project. Mobile payments, despite their potential, have failed to reach expected adoption levels. It was therefore apparent that more holistic and comprehensive research is necessary to discover the multitude of factors that might influence adoption and diffusion of mobile payment systems. This study therefore aims to develop a multi-perspective framework that will incorporate investigations on various issues that provide interesting findings on their own, but at the same time fit together as one coherent whole that forms a roadmap of success factors for mobile payments. The outcome is hoped to benefit numerous stakeholders. Providers will be able to better explain, predict and account for the factors that will facilitate the adoption and diffusion of their products.

The scope of the research was also discussed by delimiting the span of the mobile payments concept. To provide a better understanding of this study's topic, an overview of existing mobile payment solutions and their characteristics was provided.

This chapter has provided the background on the topic and objectives of this study; the following chapter aims to identify a research framework that would be most suitable to both the topic and the objectives.

2. Theoretical Background and Methodology

This chapter explains the choices made for this study in various levels of the research framework. It starts with an outline of the underlying epistemology (constructionism), and a theoretical perspective (interpretivist symbolic interactionism) on which the study is based. Subsequently, it explains the research methodology (grounded theory). The rationale behind the choice of qualitative research methods for this thesis is also presented.

2.1 Research Framework

A number of choices about research need to be made before a study commences. These include epistemology, theoretical perspective, methodology, and methods that will underpin the research. Epistemology is the theory of knowledge (Crotty, 1998), and it can be seen both as a philosophy of human knowing, and how one learns about it (Glaser, 2005). A theoretical perspective on the other hand is the philosophical stance lying behind a methodology (Crotty, 1998). It is an approach to understanding and explaining the human

world and social life within that world, or the way of looking at the world and making sense of it; it encompasses assumptions upon which the specific methodology is based (Crotty, 1998). It is important to explain in this thesis since it brings a number of assumptions to the chosen methodology; the latter means a strategy, plan of action, or in other words, a research design. Finally, research methods are concrete techniques and procedures employed in the research (Crotty, 1998). The different levels form a research framework presented below.

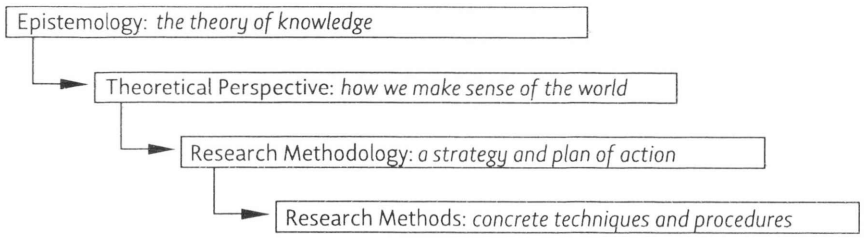


Figure 6: A research framework

The above Figure 6 illustrates how epistemology, theoretical perspective, methodology, and research methods interlink. The following sections provide more details about each of the layers of the diagram.

2.2 Constructionism as the Epistemology

The design of this mobile payment study is based on constructionism as its epistemology. Constructionism is the view that all knowledge and meaningful realities are being constructed in and out of interaction between human beings and their world; furthermore, the meanings are developed and transmitted within a social context (Crotty, 1998). There is no objective truth inherited in objects, waiting for us to be discovered. Truth and meaning only come in existence when we engage with the realities in the world. Meaningful reality does not exist

without human consciousness, without a mind. Meaning is not discovered, but rather constructed by human beings as they engage with the world (Crotty, 1998). A chair, for example, exists merely as an object when no consciousness is aware of its existence. It exists as a chair only if conscious beings construct it as a chair. Mobile payment systems in this research therefore are not studied in isolation, but through the conscious beings engaging with them – users, providers, and other stakeholders.

Constructionists not only believe that no object can be adequately described in isolation from the conscious being experiencing it, but also that no subject's experience can be described in isolation from its object (Crotty, 1998). Meanings only emerge when consciousness engages with the objects in the world. The meanings are generated from the subjects' interaction with the objects, and relate to them essentially, so they are not subjective meanings imposed on the objects. Humans therefore need objects to generate meanings; meaning is born out of humans engaging with their human world (Crotty, 1998). Similarly in this study, the subjects' experiences are always related to the real world objects; the meanings are generated from the subjects' use of specific devices, mobile payment systems, or traditional payment procedures.

Constructionism also holds that the meanings are made by social and conventional means. The basic generation of meaning is always social, for the meanings arise in and out of interactive human community, and we are already born into the world of meaning (Crotty, 1998). This stance dictates that different people may construct meaning in different ways, even about the same phenomena (Crotty, 1998). It is possible to make sense of the same reality in quite different ways. There is no true or valid interpretation. In this research,

various participants' perceptions are taken into account, and they are only excluded from the theory if not confirmed further by the remaining data.

2.3 Interpretivist Symbolic Interactionism as the Theoretical Perspective

The previous section has situated constructionism as the suitable epistemology to guide this research. A theoretical perspective includes the assumptions about how we understand, or make sense of the world. The theoretical stance that guides this study, symbolic interactionism, is one of perspectives that are often broadly referred to as interpretivism. This term is frequently used to describe the opposite of positivist stance; several various perspectives however belong to interpretivist approach, such as phenomenology, hermeneutics, and symbolic interactionism (Crotty, 1998). Symbolic interactionism has been chosen as the stance guiding this research, and after a short rationale behind interpretive approach in general, the reasoning behind the choice of the specific perspective of symbolic interactionism is presented.

All the interpretivist stances are based on the belief that any understanding of causation comes through an interpretative understanding of social action and involves an explanation of relevant antecedent phenomena as meaning-complexes (Crotty, 1998). The interpretative approach looks for culturally derived and historically situated interpretations of the social life world (Crotty, 1998), and it focuses on the concept of Verstehen (understanding). Social inquiry should focus on the meanings and values of acting persons, and therefore on their subjective 'meaning-complex of actions'.

According to Myers (1997), interpretivist studies generally attempt to understand phenomena through the meanings that people assign to them. Interpretive methods of research in Information Systems are aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context. Interpretive research does not predefine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges (Myers, 1997).

On the contrary, positivists generally assume that reality is objectively given and can be described by measurable properties which are independent of the observer (researcher) and the instruments. Positivist studies generally attempt to test theory, in an attempt to increase the predictive understanding of phenomena (Myers, 1997). Information Systems research is positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from the sample to a stated population (Myers, 1997).

The author of this thesis is less interested in looking for objective numerical data about mobile payment systems, but rather has more interest in discovering meanings people assign to the phenomena studied, the influence of context on mobile payment systems, and the full complexity of the situation. The interpretivist approach, therefore, is seen as the suitable approach for this study.

Of the various interpretivist approaches, symbolic interactionism seems to be particularly well suited to this research on mobile payment systems. This stance holds that the actors' views of actions, objects, and society have to be the focus of the enquiry. A situation must be seen as the actor sees it, and the meanings

must be determined in terms of the actor's meanings. The actors' meanings are accepted at face value, and systematic interpretations are based on them (Mitchell, 1977). In this research, interpretations are based on the meanings of the participants, and the situation is seen as the participants see it.

The researcher in symbolic interactionism needs to take the standpoint of those that they study (Denzin, 1978). Symbolic interactionism focuses on social interactions which allow the researcher to enter into the perceptions, attitudes, and values of the participants. The author of this study aims to put herself into the place of others. This process of role taking is the 'interaction' that gave the stance a name, and it is 'symbolic' because it is made possible because of 'symbols', especially language that people share and through which they communicate. The dialogue makes it possible for the researcher in this study to become aware of the others' perceptions and attitudes, and interpret their meaning and intent (Crotty, 1998).

2.4 Grounded Theory as the Research Methodology

Constructionism and interpretivist symbolic interactionism provide theoretical background of this study. Research methodology on the other hand is a more practical concept since it refers to a strategy, or a plan of action.

Grounded theory approach is the research methodology where research does not commence with a theory, but a theory emerges from the research (Burns, 1997). A theory is a set of well-developed concepts related through statements of relationships, which constitute an integrated framework that can be used to explain or predict phenomena (Strauss & Corbin, 1998). This methodology seems particularly suitable to this research that aims to identify a multi-perspective

framework of factors that would help explain and predict adoption and diffusion of mobile payments.

Furthermore, in a grounded theory study, the researcher may not know enough to formulate hypotheses, and therefore the research participants are used as the main source of knowledge (Auerbach, 2003). They are experts of the phenomenon being studied since they are experiencing it directly. In line with the grounded theory method, the participants in this project are seen as experts who have, through their experience, most knowledge about the topic.

The grounded theory methodology was proposed by Glaser and Strauss (1967); in this methodology, researchers develop hypotheses based on the participants' data (Auerbach, 2003). In grounded theory research, data collection, analysis, and eventual theory stand in close relationship to one another (Strauss & Corbin, 1998). The grounded theory, and therefore this study too, is based on two basic principles: (1) questioning rather than measuring, and (2) generating hypotheses using theoretical coding. As further explained by Denscombe (2004), in grounded theory concepts and theories are developed out of the data collected in a process of comparing the ideas with existing data, and subsequently improving the emerging concepts and theories by checking them against the new data collected specifically for this purpose. Theoretical concepts are discovered in the data, and have to prove themselves in the additional data (Hildenbrand, 2004). The full continuum of the research process, including entering the field, methods of data collection, coding, sorting, integrating of categories and constructing theory, is guided and integrated by the emerging theory (Glaser, 1978). Any theory developed in such research should remain closely in touch with its origins in the data - it should be grounded in empirical reality (Denscombe, 2004); accordingly, this strategy has guided this mobile payment study.

The main strength of grounded theory, according to Glaser (1999), is that it provides the whole methodology, or a series of systematic and exact methods on how to get from systematically collecting data to producing a conceptual theory; in Glaser's (1999) words, grounded theory is a "total methodological package". It is a rigorous methodology woven together by constant comparison and conceptualization (Glaser, 2002). It provides rules for every stage on what to do and what to do subsequently (Glaser, 1998). A grounded theory is now a recognized rationale for qualitative research (Denscombe, 2004). A recognized methodology that includes clear and rigorous procedures for every stage of the research process seems a very appropriate choice for this doctoral dissertation.

Furthermore, grounded theory emphasizes the importance of empirical data, and the need to link any explanations or theories with what happens in practical situations, in "the real world". The theory is based on practice, not on the abstract that is only later checked in the reality (Denscombe, 2004). The advantage of using this method is that the theories are developed and gradually built up on the basis of empirical research. According to Glaser (1999), grounded theory tells us what is really going on, it shows us what actually is, not what should be. This is well suited to this study that aims to discover the reality of mobile payments, not what is expected, assumed, or speculated about.

Grounded theory is also based on pragmatism, which places great emphasis on the "practical" rather than on "abstract" (Denscombe, 2004). Theories in this approach are not valued at their abstract level, but rather by how well they address real practical needs and how well they work in practice. This approach fits perfectly this study that focuses on how mobile payment systems work in practice, or the "real world", not just in theory. Glaser (1999) sees this "relevance" of grounded theory as one of its most appealing aspects. It results in theories

that are relevant to what is going in the given field. It provides answers that actually work.

In addition, a grounded theory goes beyond simply describing social phenomena under study; it does not just describe what is happening (Corbin & Strauss, 1990). A grounded theory provides explanations; it discovers conceptual patterns that underlie facts. The methodology provides a grounded theory for what is going on in the studied area, which is particularly appealing to the researcher who aims to explain the underlying patterns in the mobile payment field. Glaser (1999) claims that grounded theory not only explains what is going on, but also how to account for the participants' main concerns, and it reveals access variables that allow for incremental change. Grounded theory builds a theoretical explanation by specifying phenomena in terms of conditions that give rise to them, how they are expressed through action/interaction, and the consequences that arise from them (Corbin & Strauss, 1990). Companies that want to offer successful mobile payment solutions need to understand high-impact dependent variables that would help them improve such solutions, as well as the conditions and consequences involved.

Grounded theory (Glaser, 1999) provides specific answers to problems, not just ideologies that are supposed to work. It can change the preconceived processes in the field of practice. Real answers, discovered through real data, become relevant and fit. In fact, Glaser (1999) suggests two main criteria for judging the adequacy of the emerging theory: that it fits the situation, and that it works, or, in other words, that it helps the people in the situation to make sense of their experience, and to manage the situation better. Grounded theory in this research can provide answers that may help mobile payment providers to manage the situation better.

Another advantage of grounded theory is that it is also easily modifiable to keep up with fast pacing changes (Glaser, 1999). New data can constantly modify the theory through comparisons. This modifying of theory makes it possible to constantly keep up with what is going on as changes occur, which seems especially important in the fast changing field of mobile payments.

Data for a grounded theory can come from various sources, including interviews, observations, documents, video tapes, books, and others (Corbin & Strauss, 1990). The researchers should use the usual guidelines and procedures suggested for a given method. Denscombe (2004) sees this adaptability of a grounded theory method, allowing a variety of qualitative data collection methods, as one of its strengths.

Grounded theory can also combine the depth and richness of qualitative interpretive research with the rigour, logic, and systematic analysis typical of quantitative survey traditions (Denscombe, 2004). It is unlikely that a grounded theory will be refuted by new data since the theory has been built upon substantive data extracted from the field, covering a multitude of the crucial aspects of the situation (Denscombe, 2004). The testing is conducted as an integral part of the development of the theory (Glaser & Strauss, 1967).

There have been variations of the grounded theory proposed in the literature; one of controversies surrounding grounded theory involves a split between its co-originators, Glaser and Strauss (Glaser & Strauss, 1967). Strauss and Corbin (Strauss & Corbin, 1990; Corbin & Strauss, 1990) proposed their version of grounded theory, and were then accused by Glaser (1992) of diverting too much from the original methodology. Most of the differences between the two versions lie in their perspectives regarding the data analysis process, especially the

procedures used (Walker & Myrick, 2006); therefore, further discussion of the differences and the choice of the perspective for this study are presented in the Data Analysis Principles and Procedures chapter (Chapter 5) of this thesis.

To sum up, the advantages of employing grounded theory as the methodology in this research include:

- grounded theory is now a recognized rationale for qualitative research;
- it does not need hypotheses to commence with, but hypotheses emerge from the research;
- it is based on the expertise of the participants;
- it results in an integrated framework that can be used to explain or predict phenomena;
- the methodology provides a series of systematic and exact methods for every stage of the research process;
- grounded theory discovers what actually is, not what should be;
- there is focus on practice, and what is practical;
- grounded theory provides explanations about patterns that underlie facts;
- it offers relevant answers to problems;
- it is modifiable to allow for change;
- the approach is adaptable, allowing a variety of qualitative data collection methods;
- verification is an integral part of the development of the theory.

2.5 Qualitative Research Methods

The study in question is undertaken using qualitative methods; the rationale for this choice follows. Qualitative research, as defined by Auerbach (2003), is research based on analysis and interpretation of texts and interviews in order to discover meaningful patterns descriptive of a particular phenomenon. As Strauss and Corbin point out (1998), qualitative research refers to research about persons' lives, lived experiences, behaviours, emotions and feelings, but also about organizational functioning, social movements, or cultural phenomena. Qualitative analysis refers to non-mathematical process of interpretation for the purpose of discovering concepts and relationships (Strauss & Corbin, 1998). Quantitative research, on the other hand, examines the relationship between a dependant and an independent variable, where both of them must be measurable numerically (Auerbach, 2003).

The choice of the approach depends on: a) the underlying research paradigm, and b) the suitability of a particular approach to the study. Regarding the research paradigm, while positivists tend to employ quantitative methods, studies that are based on the interpretivist approach, such as this thesis, are rather based on qualitative research. The further suitability of the qualitative approach to this particular study is explored below.

As mentioned above, in quantitative research variables need to be measurable numerically (Auerbach, 2003). While it is seen as useful to discover how statistically significant is the correlation between, for example, ease of use and users' intention to use the new system, the author believes that such research would not explain the full complexity of such ease of use concept. This might include how easy to use a mobile payment systems needs to be, what the

participants actually mean when they think about ease of use, what specific features would make the system easy to use, and others. 'Ease of use' of the new payment system may mean something completely different to each participant, and it is this depth and richness of data gathered, and the lack of common terms in the emerging field that favour qualitative research in this study.

Creswell (1998) also recommends a qualitative study when a detailed, close-up view of the topic is sought. One success factor may prove to be statistically more influential than another, but the reasons for it, the way to achieve it, or the context that makes the factor more important may be lost. Qualitative research makes it possible to obtain such details about phenomena as feelings, thought processes, and emotions that are difficult to learn about through quantitative methods (Strauss & Corbin, 1998). Quantitative research might also miss numerous other important factors that the researcher would not think of at the beginning of the study.

While quantitative methods are based on hypothesis testing, qualitative research is often used to generate hypotheses. As Auerbach (2003) explains, qualitative research is more suitable where we do not know enough to state meaningful hypotheses. Gorman and Clayton (2005) point out that qualitative research is more likely to begin with evidence, but no theory. It allows for discovery of new ideas (Gorman & Clayton, 2005). Mobile payment is still an emerging field, in the early stages of its development; this favours a qualitative approach that does not require a hypothesis with which to begin.

Another important point is that the ultimate goal of qualitative research is to understand those being studied from their perspective, or from their point of view (Gorman & Clayton, 2005). It is based on the view that the meaning we

attach to reality is socially constructed, which agrees with symbolic interactionism guiding this study. Social constructs are complex and always evolving, making them less agreeable to precise measurement or numerical interpretation (Gorman & Clayton, 2005). Success factors studied in this research are such 'social construct' variables that may be too complex to fit statistical measurements of a quantitative approach.

It is not only the complexity of factors which demands a qualitative approach. Qualitative research methods have also been chosen for this study because they are designed to help researchers understand people and the social and cultural contexts within which they live (Myers, 1997). The phenomenon's social and institutional context is largely lost when textual data are quantified (Myers, 1997). This study aims to discover social, cultural, and institutional contexts that may influence the lack of adoption and diffusion of mobile payment systems.

Additionally, what qualitative research reveals, according to Burns (1997), is not objective truth, but rather the truth as the participants perceive it. Similarly, in this research the aim is to discover why potentially perfect systems, based on the latest technologies, still fail. Final acceptance or rejection may depend, for example, not just on how secure the system really is, but on how secure the users perceive it. The success or failure of an m-payment system depends on subjective opinions of its end users. Variables in a quantitative approach must be measured numerically; therefore they cannot reflect this subjective experience (Auerbach, 2003).

Burns (1997) additionally posits that qualitative methods are able to uncover real and hidden agendas of organizations, as opposed to stated agendas. They delve in-depth into the process, and they uncover informal and unstructured links and

processes. Similarly, in this research the goal is to uncover the hidden truth behind the success or failure of mobile payment systems.

Figure 7 below summarizes the arguments that explain the suitability of qualitative research for this mobile payment study.

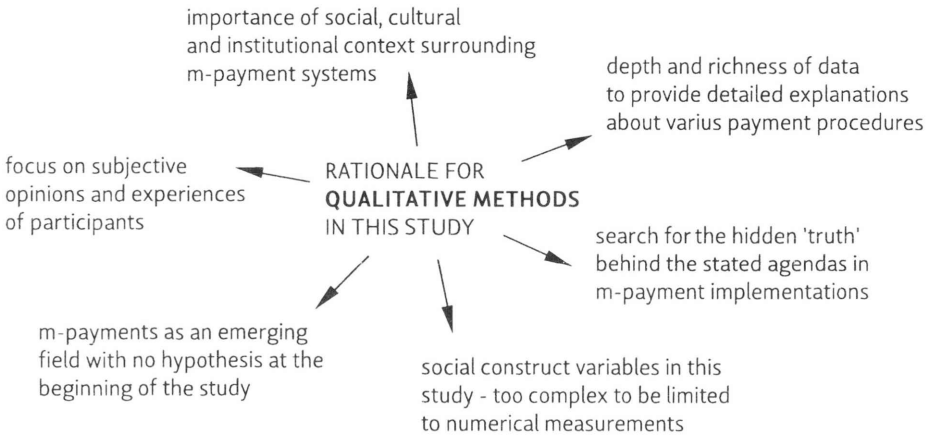


Figure 7: Advantages of using qualitative research methods in this study

2.6 Chapter Review

This chapter has outlined the epistemology (constructionism), theoretical perspective (interpretivist symbolic interactionism), the research methodology (grounded theory), and research methods (qualitative) adopted in this study. The following Figure 8 illustrates the choices made in each layer of the research framework. The rationale for each of those choices has been provided throughout this chapter.

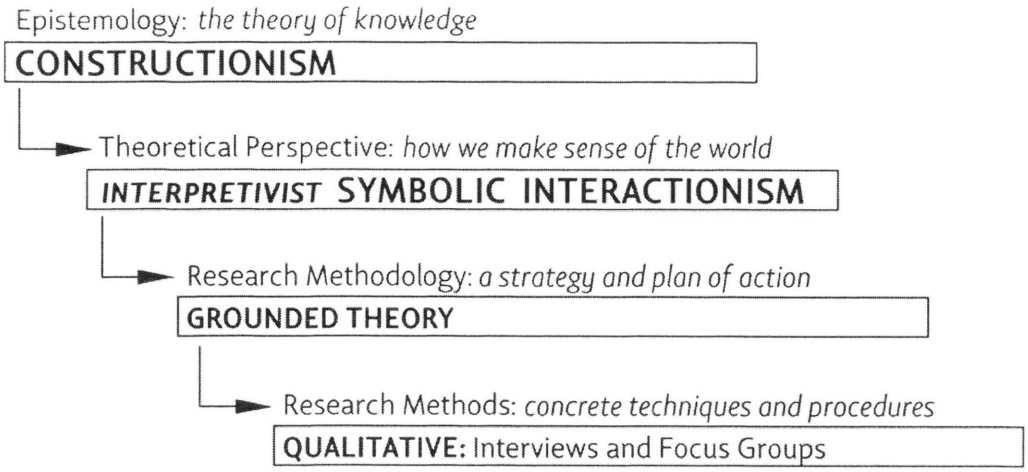


Figure 8: The research framework employed in this study

Constructionism holds that a meaningful reality does not exist without human consciousness. This study focuses on meanings that are constructed by human beings, the participants, when they engage with the realities of mobile and other payment systems in the real world.

Interpretivism that underpins this project is based on the belief that we can only understand phenomena through the meanings that people assign to them. Inquiry should focus on the meanings and values of acting persons, and therefore on their subjective 'meaning-complexes'.

Symbolic interactionism, one of the interpretivist stances, was adopted as a theoretical perspective guiding this study. The researcher in symbolic interactionism needs to take the standpoint of those that they study. This process of role taking is the 'interaction' that gave the stance the name, and it is 'symbolic' because symbols, such as language, make it possible.

In the methodology chosen for this study, namely grounded theory, research does not commence with a theory, but rather theoretical concepts are discovered

and have to prove themselves in the data. The whole research process – including methods of data collection, coding, sorting, integrating of categories, constructing theory, and performing a literature review – is guided and integrated by the emerging theory. Any theory developed in such research remains closely in touch with its origins in the data – it is grounded in the empirical reality. There is also focus on practice, and what is practical, which is especially important in this study that aims to present practical recommendations to providers. Grounded theory offers a rigorous methodology, with a series of systematic and exact methods at every stage of the research process, which in turn provides a valuable guidance in this dissertation.

This research is based on qualitative research methods. Such methods are employed when, such as in this study, the researcher is interested in attitudes, beliefs, feelings or thought processes surrounding the phenomena studied instead of numerical measurements of those. Such methods are also suitable since a detailed, close-up view of the topic is sought in this research, and depth and richness of data are required to account for social, cultural, and institutional contexts surrounding mobile payments.

After the rationale for the choices made in the various levels of the research framework has been explained, the next issue that presents itself to the researcher is investigating how to ensure the quality and rigour of this study. This becomes the topic of the following chapter.

3. Rigour and Quality of Research

The previous chapter has revealed the theoretical and methodological background of the current study. The next issue that requires the researcher's attention is specifying rigorous procedures that will ensure the high quality of this research during the various stages of the project. Therefore, this chapter firstly explores criteria that have been proposed to ensure the quality of qualitative research, and discovers the lack of consensus in the literature. It is subsequently proposed that qualitative research encompasses too many varied methodologies to apply generic measures, and therefore specific procedures that are found suitable to the study's methodology, grounded theory, are identified and applied.

3.1 Review of Quality Criteria in Qualitative Research

It has been the personal experience of the author that some researchers, especially in the Information Technology field, tend to see quantitative research as somehow superior to qualitative one, and they would not consider a qualitative study a rigorous one. As Creswell (1998) points out however,

qualitative research *"shares good company with the most rigorous quantitative research, and it should not be viewed as an easy substitute for a statistical or quantitative study"* (Creswell, 1998, p. 16).

There has been a growing interest among researchers in understanding what rigour in qualitative research means, and making scholars more aware of procedures they employ in qualitative studies (Morse et al., 2002; Chiovitti & Piran, 2003). Standards of rigour for qualitative research have been discussed, for example, by Beck (1993) or Guba and Lincoln (1989). The grounded theory authors themselves, Glaser and Strauss (1967), also debate the issue of rigour in a qualitative enquiry.

The terminology used to discuss rigour and quality in qualitative research appears to be inconsistent to the author of this thesis; it seems to vary according to different sources. Some of such diverse attempts to define rigour and quality in qualitative research are presented below:

Burns's (1997) reliability, internal validity and external validity

Reliability and validity, traditional quantitative quality concepts, can be applied to qualitative research as well, according to Burns (1997). Reliability is achieved when the same results are obtained consistently under the same conditions. Other researchers should be able be replicate the steps of the research, using the same categories of the study, criteria and types of experts (Burns, 1997). Validity deals with assessment or judgement measuring what it is supposed to measure. Internal validity is achieved when researchers actually observe or measure what they think they are observing and measuring (Burns, 1997). External validity, as further explained by Burns (1997), depends on the identification and description of those characteristics of phenomena salient for comparison with other similar

types. Bases for comparison must be easy to assume, so that results can be translated for applicability across sites.

Stenbacka's (2001) objection against reliability criterion

Stenbacka (2001) holds an opposing view, and argues that since reliability issues concern measurements, it has no relevance in qualitative research. She points out that the issue of reliability is an irrelevant matter in the judgement of the quality of qualitative research.

Lincoln and Guba's (1985) essential criteria for quality

Credibility, neutrality or confirmability, consistency or dependability, and applicability or transferability are the essential criteria for quality in qualitative research, according to Lincoln and Guba (1985), who further emphasize an inquiry audit as one measure which might enhance the dependability of research.

Beck's (1993) components of rigour

Yet another view is presented by Beck (1993) who posits that credibility, auditability, and fittingness are the three crucial components of rigour in qualitative research.

As revealed through the examples above, there seems to be no consensus about the various criteria that establish quality of qualitative research. To sum up, some of the terms proposed in this section include reliability, internal validity, external validity, credibility, auditability, fittingness, neutrality/confirmability, consistency/dependability and applicability/ transferability, as well as inquiry audit. What happens, according to some researchers, is simply *"substituting new terms for words such as validity and reliability to reflect interpretivist [qualitative] conceptions"* (Seale, 1999, p. 465). The lack of the consensus on the issue is

confirmed by Sandelowski and Barroso (2002) who note that scholars have for years tried to define what constitutes good and valid qualitative research, but they conclude that *"after all this effort, we seem to be no closer to establishing a consensus on quality criteria, or even on whether it is appropriate to try to establish such a consensus"* (Sandelowski & Barosso, 2002, p. 2). This illustrates that the question of what constitutes quality in qualitative research is by no means answered, and it seems to the researcher a topic large enough for another three-year-long dissertation, and clearly beyond the scope of this study.

Because of the lack of agreement about how to measure quality in qualitative research, it is especially important to the author of this study that the methodology of grounded theory provides rigorous procedures and guidance in every step of the research process. Grounded theory is a methodology that, when performed correctly, guarantees accuracy of the results through its constant comparison method (Glaser, 1992). Glaser and Strauss (1967) suggest that if theory is grounded in data, then it has already been verified. The method of constant comparison, if performed properly, verifies the accuracy of the study through the comparison itself. Verification resides within it (Glaser, 1992). Grounded theory does not need additional verification: "*Grounded theory looks for what is, not what might be, and therefore needs no test. Grounded theory gets its concepts from the data; it does not bring ideas to force on the data that need to be subsequently tested"* (Glaser, 1992, p. 67).

To make sure that grounded theory is performed correctly in this study, much care and attention have been given to learn and understand every step of this methodology. To ensure methodological rigour, various books on grounded theory have been consulted to learn procedures and techniques that would guide the process. The procedures, their sources, and their applications are explained

in the Data Collection and Data Analysis chapters of this thesis (Chapters 4 and 5, respectively), with a number of examples and graphics.

Additionally, the stance adopted for ensuring rigour and quality in this study has been influenced by Rolfe (2006) who proposes an explanation on the lack of the consensus on judging the quality of qualitative research. According to Rolfe (2006), there is no unified qualitative research paradigm, and very varied methodologies are classified together as qualitative; such methodologies are frequently based on very different assumptions and procedures, too different to fit some generic quality criteria. Rolfe (2006) notes that each study using a given methodology is unique, and therefore should follow unique quality criteria suited for it.

It has been therefore revealed that there is no consensus on the generic criteria that would establish quality of qualitative research; additionally, the preceding paragraph concluded that such a set of generic criteria should not even exist since qualitative methods may belong to various paradigms and methodologies. Based on these two factors, the researcher in this study focuses on applying such quality procedures that would be suitable to the grounded theory methodology, not generic procedures that are claimed to fit all 'qualitative research'. As the next section reveals, instead of forcing such generic criteria and procedures proposed for all 'qualitative studies', various techniques and procedures have been used in this study as they fit grounded theory. Multiple coding, for example, as will be shown, would not be feasible in this grounded theory research where data has had to be immediately analysed after they were collected; a process that spread over almost 2 years. As another example, member checking is something that happens automatically in grounded theory, which will also be explained in the following section.

3.2 Procedures Used to Improve Research Quality

Regardless of the lack of the consensus on the quality criteria in qualitative research, the author of this study at all times aims to produce high quality and rigorous research that would be true to the actual phenomenon, trustworthy, defensible, free of bias, understood by others, and significant to both researchers and providers.

A number of techniques and procedures have been reviewed and applied in this research to reach these objectives. They are not generic 'fit-all' procedures, but, as revealed in the previous section, procedures that are suited to the grounded theory methodology of this study. They have been employed in various stages of the research, including sampling, coding, and reporting.

Triangulation

A commonly used technique to improve research quality is triangulation. Burns (1997) defines it as the use of two or more methods of collecting data in the study of some aspect of human behaviour; this research therefore uses open-ended Web surveys, email interviews, in-person interviews, and focus groups, all based on varied data sources. This eliminates bias and distortion. Triangulation, according to Burns (1997), contributes to verification and validation of qualitative analysis by examining both the consistency of findings generated by different data collection methods, and the consistency of different data sources within the same method.

As Gorman and Clayton (2005) point out, competent researchers nowadays realize that confining an investigation to a particular approach does not provide the fullest understanding of a phenomenon. When two or more methods are

employed, different aspects of the same research question can be addressed, extending the breadth of the project. Collecting information from several sources about the same event or behaviour is a procedure for cross-validating information. Such a mix of methods improves the quality of research, since conclusions arrived at by using several different means are more likely to be correct, and accepted as such (Gorman & Clayton, 2005). Liamputtong and Ezzy (2005) similarly observe that since research methods are not neutral tools that will produce the same results regardless of the method, triangulation addresses this problem. Triangulation in this study also allows the researcher to develop a complex picture of the phenomenon being studied, which might otherwise be unavailable if only one method were utilised. This procedure also fits grounded theory research well since, as Glaser (1998) points out, anything can become data for generating theory, regardless of disparate data collection methods.

Participants guiding the data collection process

One of the rigour criteria proposed by Beck (1993), credibility, deals with the fact that phenomena investigated must be accurately identified and described from the perspective of the participants. The grounded theory approach helps to achieve this objective because data collection is guided by the participants themselves. As Chiovitti and Piran (2003) recall, in their grounded theory study, modifying of the interview guides, questions asked of the respondents and content areas of the emerging theory, according to incoming information from the interviewees, allowed the participants to guide the research process, and therefore enhance credibility. The questions in this thesis study have also been constantly redeveloped according to the emerging categories suggested by the informants. The Data Collection Principles and Procedures chapter (Chapter 4) presents examples of how research questions have been evolving based on the incoming and instantly analysed data.

Constant comparison method

The 'constant comparison method' of grounded theory involves constant comparing and contrasting of new codes, categories and concepts as they are emerging. Such comparing of each coded instance with others, as well as contrasting them with those in different categories, improve and refine the explanatory power of the concepts and theories generated from this data (Denscombe, 2004). Verification therefore is built into grounded theory – hypotheses are constantly tested against evidence (Dey, 1999).

Even if the new evidence appears, grounded theory is rarely discarded – rather, it is easily modifiable: *"The theory should not be written in stone [...], it should be readily modifiable when new data present variations in emergent properties and categories. The theory is neither verified nor thrown out, it is modified to accommodate by integration the new concepts"* (Glaser, 1992, p. 15).

Therefore, verification is assumed in grounded theory since it constantly tests new emerging hypotheses in data. Generation and verification of grounded theory happen simultaneously.

Member checking

Member checking, according to Guba and Lincoln (1989), is *"the single most critical technique for establishing credibility"* (p. 239). It refers to returning to the participants following the data analysis and asking them to verify the correctness of identified codes and properties. This procedure seems to be built into the grounded theory methodology where the analysis starts as soon as the data is collected, and the emergent codes are used to shape the subsequent surveys and interviews. Because identified codes and properties are used in further data collection, they are automatically further verified by the participants.

Participants' terminology used to generate the theory

Another procedure that Chiovitti and Piran (2003) propose to improve credibility of the research is using the respondents' actual words in the theory. This is in line with Glaser and Strauss's (1967) stance that grounded theory reveals what is, not what should be. This dictum has been followed extensively in this study, where the actual words of the participants have been used to name categories and properties, instead of traditional terms used in well-known models. Some examples of such terms based on the participants' words include, for example, Ability to keep track of purchases, or Mobile operators' openness to new technologies. Additionally, numerous quotes presented to the reader in the Emerging Theory chapter (Chapter 6) evidence the suitability of the naming used for the codes in this theory.

Transparency of research design reporting

Auerbach (2003), after Rubin and Rubin (1995), proposes applying the following criteria to improve the quality of data analysis: transparency, communicability, and coherence. Transparency means that data analysis is justifiable because it can be clearly seen how it was conducted. Sandelowski (1986) refers to this process as auditability, or 'leaving a decision trail', so that the reader would be able to track and verify the research process. Corbin and Strauss (1990) also note that qualitative methods can be systematically evaluated only if their canons and procedures are made explicit. The Data Collection and Data Analysis chapters (Chapters 4 and 5, respectively) endorse the transparency of the process. They clearly explain the details of the data collection and analysis processes in this study.

Data collection and analysis must also be communicable, or understood by other researchers. Detailed explanations are therefore provided, illustrated with figures and screenshots. Numerous examples are included to better communicate the

coding process. The final criterion, coherence, means that constructs fit together in one unified account, and this is accommodated in the ability to present the theory in a visual diagram and a well-structured narrative in the Emerging Theory chapter (Chapter 6).

These three criteria, transparency, communicability, and coherence, are the ones to be judged by the reader of a study. It may be hard for the researcher herself to establish if the process is transparent enough, well communicated, and coherent. Accordingly, feedback was sought from two other researchers about the Data Collection and Analysis chapters in regards to those criteria. Their comments have been used to improve the reporting of the research design, especially when they remarked on something that was not clear enough or needed to be explained in more detail. One example was the suggestion to include the number of participants in each project in a table for better clarity in the following Data Collection Principles and Procedures chapter.

Multiple coding

A procedure proposed by Pare (2002), multiple or independent coding, is meant to ensure the reliability of the coding process, and therefore the reliability of the study. Independent coding refers to two or more coders individually assigning the issues discussed by the respondents to a suitable category (Pare, 2002). The results are subsequently compared. This procedure would have been completely unfeasible in this grounded theory research; in such research, large amounts of data have to be coded immediately after they have been collected, in this case in a process spread over almost two years. Barbour (2001) also warns against multiple coding of entire datasets because of both time and effort required; she does recommend however using some elements of multiple coding. Asking another researcher to look at the segments of data or on the emerging

categories may be useful (Barbour, 2001). Barbour (2001) also points out that the actual degree of agreement between the researchers needs not to be measured – rather, discovering the discrepancies has prompted the researcher in this study to try to understand the reasons for such alternative interpretations, and further analyse and refine the codes in question.

Glaser (1998) warns against disseminating the emerging concepts too early in the theory formation process. This grounded theory co-author notes that influences from other researchers, supervisors, and people who hear about the emerging theory may impose views on the researcher and force such views on the data, just as the known theories from the literature might do. Therefore, two researchers have been asked to look at the coded text and the emerging categories and properties only well after the theory was developed. Their feedback has not been used to change the coding immediately according to their suggestions. Rather, it has invoked more analysis on why the other person may have interpreted the code differently, often leading to the refinement of the naming or span of the code. This is very similar to the literature review process applied only after the theory has emerged, as presented in the Literature Review: Refining the Theory chapter (Chapter 7).

Verbatims in describing emerging theory

A strategy suggested to promote validity concerns using low inference descriptors in the reporting stage. This refers to descriptions phrased very close to the participants' accounts and researchers' field notes (Johnson, 1997). Verbatims (direct quotes) are a commonly used type of low inference descriptors. This thesis utilizes such direct quotes from the subjects extensively to improve validity of the research. Such examples of data not only validate the conclusions, but also provide rich illustrations of the topic.

Glaser and Strauss (1967), the co-authors of grounded theory, also note that it is important for the reader to be able to understand how the analyst obtained the theory from the data. Otherwise, the transition from data to theory is almost impossible to grasp. Providing quotes may provide such a link that will demonstrate to the reader how the researcher has come to her conclusions.

The theory that "works, fits, and is relevant"

Regardless of how other researchers judge the current study, the final test of its quality will be up to the real world, and especially practitioners who will decide if they make use of the proposed theory. Glaser (1998) proposes four final, decisive criteria which the grounded theory must satisfy: a) does the theory work to explain certain behaviour in the substantive area of research?, b) is it relevant to people in the area?, c) does the theory fit the area?, and d) is the theory easily modifiable when new data emerge? Grounded theory should *"work, fit, and be relevant"* (Glaser, 1998, p. 17).

3.3 Chapter Review

This chapter started with the review of quality criteria in qualitative research. The terminology used to discuss rigour and quality in qualitative research has proven to be widely disparate, and some of the varied quality criteria that have been proposed in the literature include reliability, internal validity, external validity, credibility, auditability, fittingness, neutrality, confirmability, consistency, dependability, applicability, as well as transferability. The lack of consensus on the meanings of such criteria was discovered. This highlighted the importance of grounded theory's rigorous methodology that would provide valuable guidance to the researcher, especially in light of the lack of agreement on how to establish quality in qualitative studies. Grounded theory, when performed correctly, tests

itself, and verification happens constantly. It has therefore been important to the researcher to learn and closely follow the grounded theory procedures.

The author of this thesis has adopted the view that wide dissimilarity of various methodologies labelled as qualitative may cause the lack of generic quality measures and criteria. Therefore, to ensure the rigour and high quality of the studies undertaken, specific techniques that suit grounded theory were explained in this chapter, and applied through the study. They include:

- Triangulation;
- Participants guiding the data collection process;
- Constant comparison method;
- Member checking;
- Participants' terminology used to generate the theory;
- Transparency of research design reporting;
- Variation of multiple coding;
- Verbatims in describing emerging theory;
- Generating the theory that "works, fits, and is relevant".

With these in mind, the researcher was ready to start collecting data. Data collection procedures are the focus of the following chapter.

4. Data Collection Principles and Procedures

This thesis has already explained the background of the mobile payment field, the theoretical and methodological perspectives that guide this study, as well as various procedures that have been applied to ensure the quality of this research. This chapter describes the procedures of data collection employed in this project. Even though it is presented before the data analysis chapter, it must be pointed out that these two processes occurred simultaneously, as required by the grounded theory approach. This chapter first outlines the rationale for the choice of various kinds of open-ended surveys and interviews as the data collection method. It then provides an overview of the theoretical sampling concept that is a significant part of the grounded theory methodology. It explains who the participants in this study were, and what types of questions were asked of them. It also demonstrates how the sampling process evolved during the course of the study, and when it was saturated. The data storage is explained as well, and the ethical considerations conclude the chapter.

Data collection started at the beginning of 2005. It was an ongoing process, and the last data was collected in September 2006. Because data collection, coding, and analysis are simultaneous processes in the grounded theory methodology, some data were even collected at later stages, when the writing up process started, to check hypotheses, categories, or their properties. Data collection principles and procedures are presented as a separate chapter for the clarity of explanation, and to make it easier for the reader to understand the research process in this study.

4.1 Surveys and Interviews as the Main Strategy for Data Collection

Grounded theory is a general methodology that can use any type of data (Glaser, 2005). It can be based on any theoretical perspective. The theoretical stance on which this thesis is based is interpretivist symbolic interactionism, as revealed in the Theoretical Background and Methodology chapter (Chapter 2). Interpretivist research methods employed in this study include open-ended Web surveys, and various forms of interviews, including face-to-face, phone, email, and focus group ones. This section outlines the rationale behind the choice of these data collection method.

Interviews play a central role in the data collection in a grounded theory study (Creswell, 1998). According to Gorman and Clayton (2005), interviewing can obtain detailed, in-depth information from subjects who know a great deal about their personal perceptions of events, which is aligned to the objective of this study. The person being interviewed can be encouraged to highlight self-perceived issues or relationships of importance. This has great value in understanding context and creating links that are key aspects of qualitative

research (Gorman & Clayton, 2005). According to Gorman and Clayton (2005), such self-perceptions and enhanced perceptions can be achieved in no other way in qualitative research. Furthermore, interviewing can enable the researcher to explore causation. As revealed in the preceding chapters, investigating contexts, relations, perceptions and causation through detailed in-depth information from the participants is the focal point of this particular study, which highlights the suitability of interviews to this research.

The rationale behind the use of open-ended Web surveys as opposed to in-person interviews in different stages of this research will be explained in the following section since it was greatly determined by theoretical sampling that guides grounded theory research; such sampling calls for the move from the widest reach and broad coverage at the beginning of the study to a more focused and selective enquiry in later stages. Such a mix of methods should not be seen as the lack of one direction, but rather as a way of obtaining as many various perspectives as possible. The advantages of such triangulation of methods were already discussed in the Rigour and Quality of Research chapter (Chapter 3). A basic assumption of grounded theory is that "all is data" (Glaser, 1998). The co-originator of the grounded theory methodology considers data *"whatever else may come the researcher's way in his substantive area of research"* (Glaser, 1998, p. 8). This may include interviews, observations, written words in magazines, brief comments, reports, charts, biases of self and others, and other 'incidents' that come the researcher's way. Glaser (1998) argues that it is important to find data by which to ground theory, regardless of the way the data were collected. This inductive approach works with any data, because anything can become data for generating theory (Glaser, 1998). In other words: *"all is data, from which theory can be generated by constant comparisons (...); grounded theory is a*

general method that can be used on all data in whatever combination" (Glaser, 1998, p. 42).

Grounded theory aims to reach theoretical saturation of a given category, and therefore Glaser and Strauss (1967) see no limits to the techniques of data collection, or the type of data collected. The founders of the methodology refer to it as "slices of data" (Glaser & Strauss, 1967), and the variety of such data slices is seen as highly beneficial since it brings more information than any one method of data collection could yield. Understanding of the differences between the slices of data in terms of the different conditions under which they were collected may further contribute to emergence of categories or their properties (Glaser & Strauss, 1967). When a theory is generated from diverse data, such as open-ended surveys and the various kinds of interviews in this study, it has taken into consideration more aspects of the area, and thanks to this, it can cope with more diversity in conditions and exceptions to hypotheses. Different sets of data are not meant to test each other, but they serve as different modes of knowing that must be explained and integrated theoretically (Glaser & Strauss, 1967), as was the case in this study.

4.2 Basics of Theoretical Sampling

Grounded theory, and therefore this mobile payment study as well, is based on theoretical sampling. In this method, the researcher decides what data to collect next and where to find them in order to develop a theory as it emerges; in other words, the process of data collection is controlled by the emerging theory (Glaser & Strauss, 1967). Sampling, rather than being predetermined by the researcher before beginning of the study, evolves during the actual research process (Strauss & Corbin, 1998). Theoretical sampling is well defined by Strauss and

Corbin (1998, p. 201) as "*data gathering driven by concepts derived from the evolving theory and based on the concept of making comparison, whose purpose is to go to places, people, or events that will maximize opportunities to discover variations among concepts and to densify categories in terms of their properties and dimensions.*"

Such sampling is based on the concepts that have been discovered during ongoing data analysis, and that appear to be relevant to the emerging theory (Strauss & Corbin, 1998). The 'relevant' concepts include those that are repeatedly present in the data when comparing incident to incident, or those that act as conditions that give variations to a category. In theoretical sampling (Denscombe, 2004), a researcher chooses a research sample in order to extend and refine a theory. The aim becomes an in-depth exploration of constructs in different contexts. Selected samples should allow the researcher to test out the emerging theoretical constructs, and verify the developing theory.

Therefore, the main question asked in such a theoretical sampling process is always to what groups/subgroups one should turn next in data collection, and for what theoretical purpose. The criteria for choosing groups are based on theoretical purpose and relevance (Glaser & Strauss, 1967). Selected groups should have theoretical relevance for further development of emerging categories (Glaser & Strauss, 1967). Samples are deliberately selected by the researcher for what they can contribute to the research, based on their relevance to emerging categories and concepts (Denscombe, 2004). The groups chosen should help generate, to the fullest extent, as many properties of the categories as possible; they should also help relate categories to each other and to their properties. Groups do not need to be comparable; they can be very different, as

long as the data apply to a similar category or a property (Glaser & Strauss, 1967).

The main advantage of theoretical sampling, according to Glaser (1998), is that the researcher is not collecting the same data over and over based on the same questions which ignore the interchangeability of indices. It also responds to the need for more data on new and emerging concepts. Theoretical sampling is also cumulative (Strauss & Corbin, 1998). Each sampled event builds from and adds to previous collection and analysis of data.

4.3 Initial Broad Sampling

The initial decisions for collection of the first data should be based on general research questions; they should not be based on any preconceived theoretical framework, according to the guidelines of Glaser and Strauss (1967). In the initial stage, individuals, organizations, and others are chosen for the study based on the general ideas of a phenomenon the researcher wants to study (Corbin & Strauss, 1990). In this mobile payment study therefore, initial data collection was not guided by any theory. The Introduction chapter (Chapter 1) revealed that in this study research questions focused on discovering factors that may improve adoption and diffusion of mobile payments. The researcher was interested in discovering as many influential success factors as possible that would cover a variety of perspectives, and would provide practical recommendations for future mobile payment implementations. Accordingly, these research questions guided the sampling in the collection of the first data.

The initial data collection was based on stratified purposive sampling, which means that cases were selected from previously identified subgroups (Gorman &

Clayton, 2005). The subgroups were identified from the analysis of existing solutions, and included various groups of industry stakeholders, such as mobile operators or bank representatives, who have had experience with real mobile payment systems initiatives. Unlike in quantitative studies, this sampling does not need to be statistically representative, since it is not going to be used to generalize to the large population. This technique not only makes it possible to gather a variety of perspectives on the research problem, but it also enhances credibility of the data that can be confirmed by several sources. Purposive sampling aims to create rich, in-depth information (Liamputtong & Ezzy, 2005).

A number of practitioners were approached to shed light on the problem area. This group of participants consisted of representatives from companies providing, considering, or being involved in mobile payment solutions. The researcher hoped that their experience with practical solutions would help to reveal a number of issues and challenges with which they have to cope. Such stakeholders were likely to know exactly what it is that hinders adoption and diffusion of mobile payments.

The companies were identified using search engines and relevant portals. The respondents included representatives of financial and banking institutions, mobile operators, third-party mobile payment system providers, phone manufacturers, mobile application developers, mobile technology consultants, and usability consultants. The participants came from Asia/Pacific region, Europe, Asia, North America, and South America.

Experts who have been involved in mobile payment initiatives were seen as one important source of knowledge; the initial analysis of data coming from these subjects pointed to the importance of understanding the users' needs as well,

and getting more insights from consumers and merchants about their issues with existing payment methods, and their views on mobile payment systems. This meant that anyone who is old enough to pay for things could be part of the sample as a consumer, and anyone who sells products and services in retail could be a potential merchant user. Purposive sampling was employed again at this stage since the aim was to reach as many subgroups as possible. Personal, academic, and industry contacts were used to reach such varied subgroups of user participants. Such subgroups included various age groups, people from various countries, students and non-students, and people in varied occupations.

As Strauss and Corbin (1998) point out, in the initial sampling the researcher is interested in generating as many categories as possible. The data collection, therefore, with both industry participants and users started with the method with the widest reach and most general questions, and moved on to more focused research in later stages. Web surveys, where the respondents were answering open-ended questions online, were seen as the most suitable method for the earlier stages of the project to obtain the fullest coverage. Theoretical sampling requires the fullest possible coverage at the beginning of research, when the main categories are just emerging; in further stages, it only requires collecting data on categories (Glaser & Strauss, 1967).

Open-ended Web surveys ensured that varied subgroups of people were able to be reached. They also ensured independence of time and place, and enabled the author to get responses from industry participants and users from all around the world. It also meant that different time zones were not a problem, since the respondent could provide their answers at any time. It also provided the participants with more convenience, especially industry respondents who were busy with corporate lifestyles and needed to find a convenient time to answer the

questions. Additionally, some of the contacts preferred to provide their answers anonymously, and the Web survey was a way to ensure this. The participants were emailed the link to the survey with an invitation to participate; the link would take them to the website with the open-ended questions. Respondents keyed in answers which, upon submission, did not identify the participant in any way. It was up to the respondents to decide if they wanted to provide their email addresses for further contact. The Web surveys were prepared using a UTS Online Survey Manager tool provided by the University's Institute for Interactive Media and Learning.

As has been noted before, initial data collection aims to obtain a broad coverage of issues, based on general research questions that will be narrowed down as the concurrent data collection and analysis progress. The questions asked of various participants should never be set at the beginning of a grounded theory study, but they should evolve according to the theory that starts emerging from the data. Therefore, the first questions that were asked to the industry participants were most general, and aimed to discover what they see as the main barriers to success of mobile payments, and what is necessary in successful implementations. No categories or factors were suggested at first, which was aligned with the aim of this study namely to discover as many influential factors as possible. Similarly, users were asked what they thought about paying with their mobile devices, if they would like it, and why. Again, at this stage, the researchers did not suggest any factors that could limit the responses. A screenshot of the initial industry Web survey is presented on the following page (Figure 9).

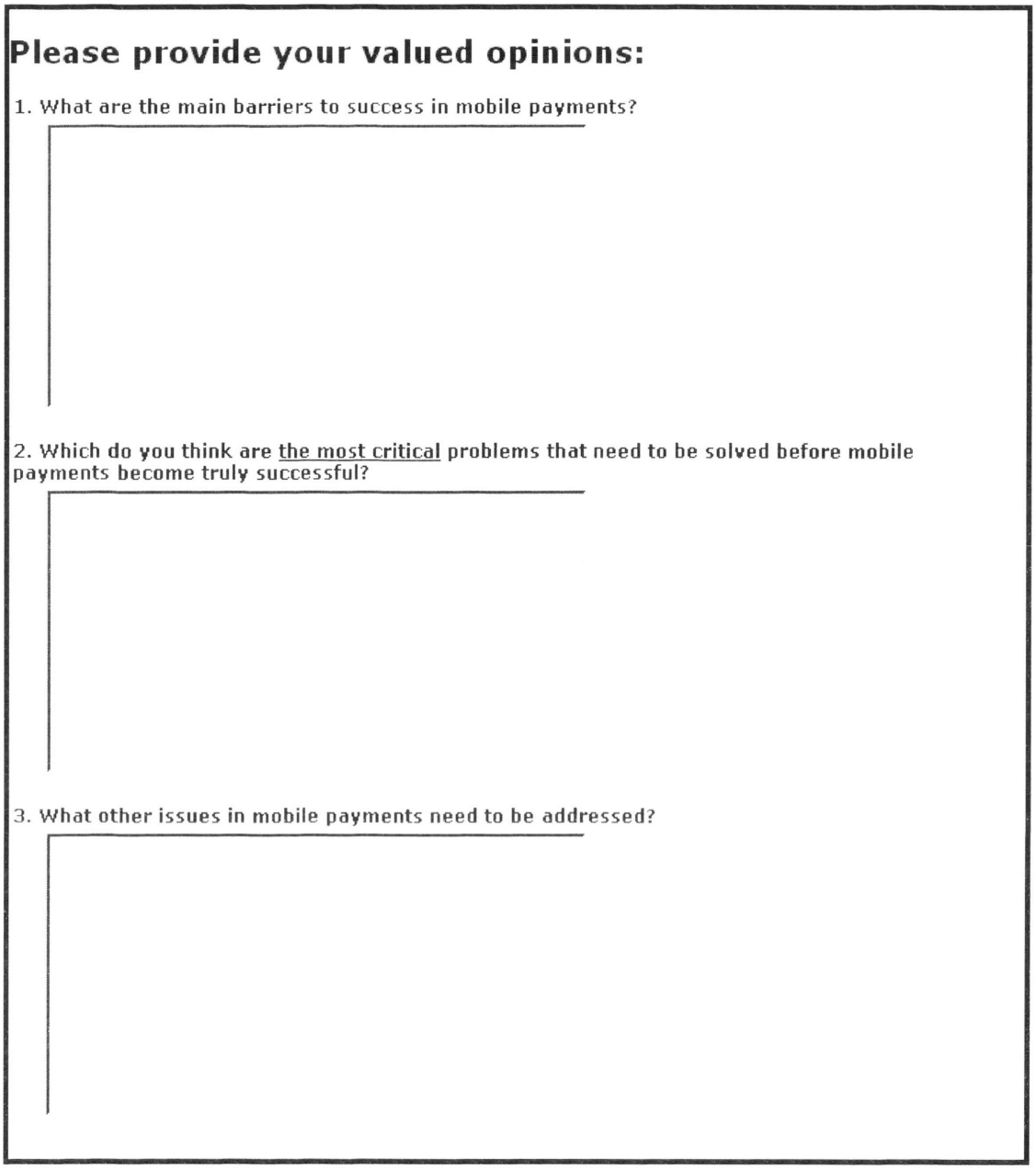


Figure 9: Screenshot of an open-ended Web survey for industry participants

To sum up, Web survey questions were very general and open-ended to elicit as many varying perspectives as possible from the participants, and the main aim was always to discover a variety of success factors for mobile payment systems. Questions that were included in the Web surveys (and similarly later on, in the

in-person interviews) evolved when the data analysis started, in line with the grounded theory approach (Glaser & Strauss, 1967). Data collection and analysis are interrelated processes in grounded theory research (Corbin & Strauss, 1990). The analysis started as soon as the first data was collected. This was necessary because analysis from the start should direct the following data collection. All concepts should be considered provisional, till they "*earn their way into the theory*" (Corbin & Strauss, 1990, p. 7) by repeatedly being present in interviews, observations, or documents in some form, or by being significantly absent. Relevance of the concept to the phenomenon must be proven through continuing scrutiny (Corbin & Strauss, 1990).

One example of such relevant issue that emerged during the data analysis process was the importance of collaboration between the players in the market. Therefore, subsequent questions to industry participants were asked about the issue, strengths and weaknesses of the parties involved, or possible modes of collaboration. As another example, it was soon revealed how important other existing payment methods are in the mobile payment analysis. Therefore, users were asked about what other methods of payments they use, what they like/dislike about them, and what features matter most to them (see Figure 10 on the following page). These examples demonstrate the benefit of performing data analysis concurrently with data collection in the grounded theory approach, which allows the questions to evolve, and therefore gather insights on perspectives that were not predicted at the beginning of the study. Such carrying out of data collection and analysis simultaneously enables the research process to capture all potentially relevant aspects as soon as they emerge (Corbin & Strauss, 1990).

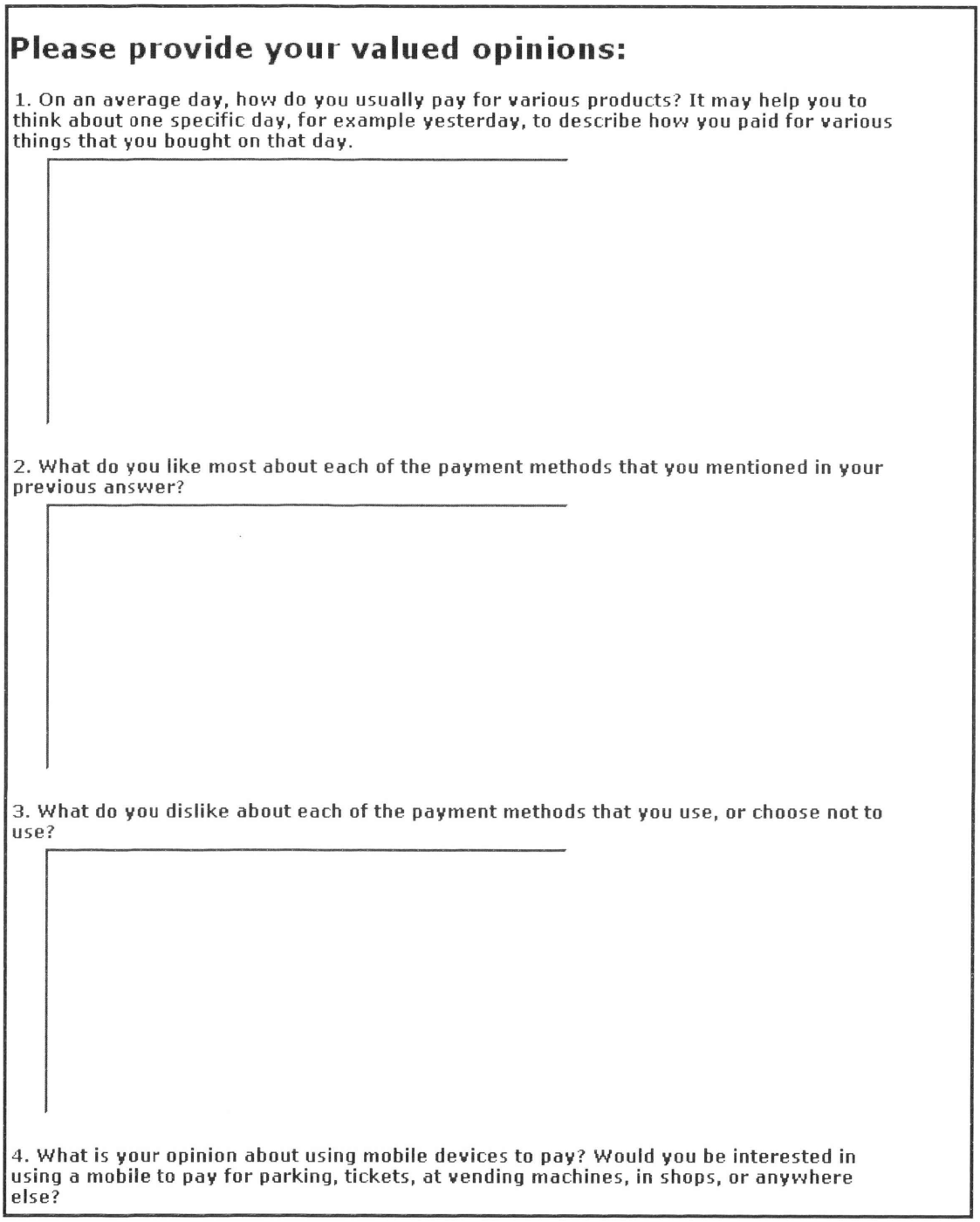
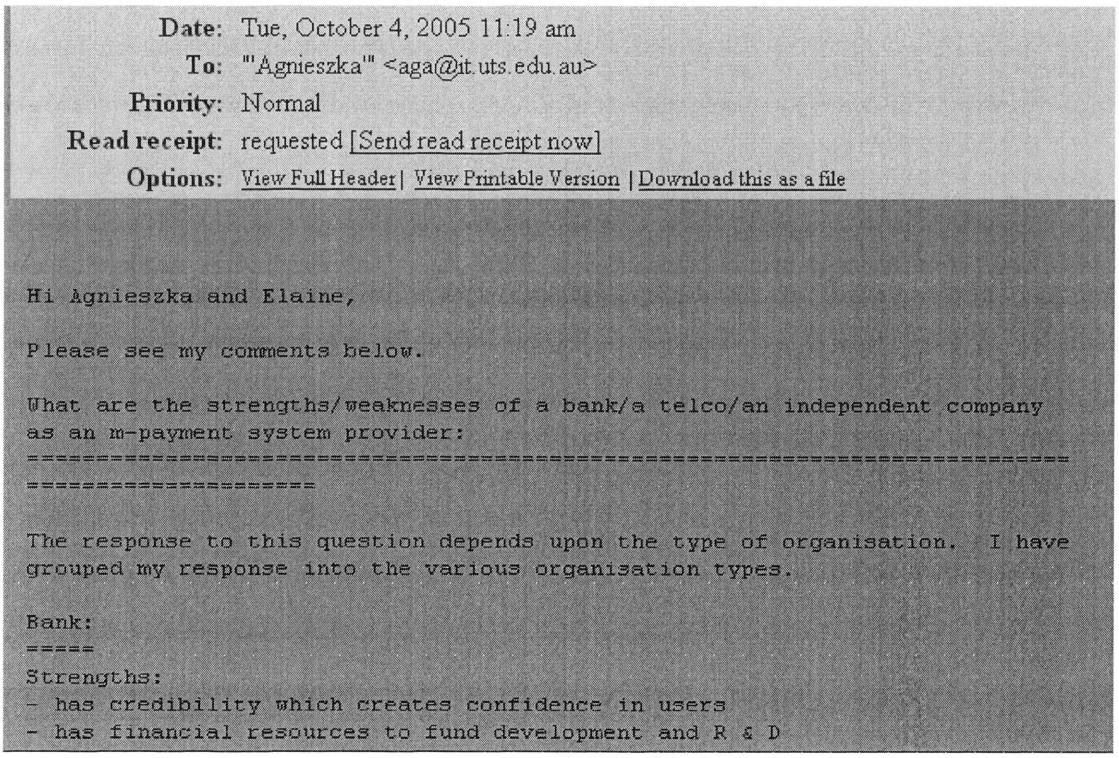


Figure 10: Screenshot of the users' Web survey with the focus shift to other payment methods

4.4 Subsequent Selective Sampling

After the initial broad-sampling stage, a number of respondents provided emails which made it easy for the researcher to contact them again with updated, or more focused questions. Some respondents also agreed to take part in face-to-face, phone or in-person interviews. The specific method depended on the availability of the participant since industry representatives from Sydney often preferred to meet in person, but those from other cities and countries had to be contacted by email or by phone. In those subsequent interviews additional data was collected on the emerging categories, as exemplified in Figure 11.



Date: Tue, October 4, 2005 11:19 am
To: "'Agnieszka'" <aga@it.uts.edu.au>
Priority: Normal
Read receipt: requested [Send read receipt now]
Options: View Full Header | View Printable Version | Download this as a file

Hi Agnieszka and Elaine,

Please see my comments below.

What are the strengths/weaknesses of a bank/a telco/an independent company as an m-payment system provider:
==========
==========

The response to this question depends upon the type of organisation. I have grouped my response into the various organisation types.

Bank:
=====
Strengths:
- has credibility which creates confidence in users
- has financial resources to fund development and R & D

Figure 11: Screenshot of an email interview with an industry participant on an emerging category of Understanding players' strengths and capabilities

Similarly, it seemed important to conduct more selective interviews with users as well. Several focus group interviews were conducted in Sydney, and some more

face-to-face interviews. Both were focusing on attitudes to mobile payments, as well as what the users like and do not like in other payment procedures; this time, however, the questions could be asked in relation to some categories and their properties that had already emerged from the data analysis. Some merchants were also interviewed with very similar questions. In-person interviews were more suitable at this stage than Web surveys since specific categories were now being explored, and in interviews dialogue can go in new directions, adding to breadth and depth of understanding of the issues involved (Gorman & Clayton, 2005). Focus groups were also suitable for obtaining a variety or perspectives and explanations in one data-gathering session. In a group session, people may be prompted to say or suggest ideas which may not occur to them on their own (Gorman & Clayton, 2005).

A specific type of theoretical sampling used in the later stages of the study was convenience sampling. The subjects were chosen based on the convenience of approaching them, and their willingness to cooperate further after the first study. Convenience sampling is based on the idea of choosing a research sample to which one has easy and immediate access (Denscombe, 2004). This strategy makes the assumption that any information obtained from the convenience sample will be informative. A researcher will not be able to obtain access to every theoretically relevant site or person (Strauss & Corbin, 1998). They should make the most of what is available to them; this has been the case in this study.

Industry interviews were conducted only where the company was willing to co-operate. The participants included several independent mobile payment providers, bank and mobile operator company representatives, a mobile application developer, and a mobile technology consultant. In terms of user interviews, the respondents were living in Sydney since all the interviews were

face-to-face, but, similarly to the earlier Web surveys, they represented various age groups, genders, and occupations. The specific numbers of participants in various stages of this study are presented in the following section that deals with the concept of theoretical saturation.

It is impossible to provide all the questions that were asked of the participants, especially in face-to-face interviews, since they became more and more diversified, as per grounded theory approach; the reader can get a good impression of the questions however by looking at the identified categories and properties of the theory presented in the Emerging Theory chapter (Chapter 6). All the interviews were guided by theoretical sampling, which means that emerging categories dictated what kinds of questions should be asked next, and to whom. To better illustrate this concept, the questions that were asked of user participants, especially in in-person interviews, tried to gather more insights about each of the earlier discovered *Consumers'* categories or properties - for example, after *Convenience* was identified as one of the adoption factors, the participants would be asked about whether and why they think mobile payment systems would be convenient, what is convenient or inconvenient about other payment procedures they use, or what they mean by convenience of a payment.

To sum up, while evolving open-ended Web surveys with their widest reach were used to obtain a broad coverage of issues, face-to-face, focus group, phone, and email interviews were used when developing, densifying, and saturating categories. Web surveys were used to reach as many participants with a variety of perspectives and generate as many initial categories as possible; in-person interviews were used to provide more depth and richness of data.

4.5 Theoretical Saturation

It is important to note again that in grounded theory, it was impossible to state before the study started how many groups or participants should be sampled during the research. Auerbach (2003) recommends that in grounded theory method, the researcher needs to keep interviewing participants until they find out that new groups of participants are not producing new data that add new concepts to the theory. The sampling should be concluded when no new information is forthcoming from new units. When the new data seems to just confirm the analysis rather than add anything new, the sampling should cease (Denscombe, 2004). The researcher needs to be able to realize how much data is enough for each theoretical point. This criterion for judging when to stop sampling the different groups relevant to a category is the category's theoretical saturation. This term means that no additional data are being found to develop more properties of the category; the same instances appear over and over again (Glaser & Strauss, 1967). Accordingly, redundancy was the primary criterion that determined when the sampling in this study should terminate; in other words, theoretical saturation was reached.

A specific category was saturated, following Strauss and Corbin (1998), when no new or relevant data seemed to emerge about the category, its properties, or relationships among them. Once saturation of the category occurred (Glaser, 1998), new questions were asked pertinent to the new emerging issues of the main concern of the new interviewees. Data collection stopped when all the emergent categories were saturated.

In terms of the sample size, in qualitative research the number of participants is less important than the richness of data (Liamputtong & Ezzy, 2005). Similarly,

data completeness in grounded theory research is based only on theoretical completeness, and not on numbers or lengths of interviews. This is in contrast to statistical sampling, where distributions of people among categories are important; what was important in this study was the discovery of categories and their properties, as well as their interrelations into a theory. The relationships in grounded theory are discovered in terms of their direction, not both direction and magnitude, as in statistical sampling (Glaser, 1998).

There is no 'N' (number of participants) in grounded theory research, only sampling for completeness and saturation (Glaser, 1998). Theoretical sampling results in an ideational sample, not a representative sample. The following Table 4 summarises the number of participants that took part in this study; this is mainly presented to better explain to the reader how the data were collected. However, as emphasized by Glaser (1998), the number of participants is not what determines the validity of grounded theory research. In each study, the saturation is reached at a certain point, and there is no correct number of participants.

Data collection method	Number of participants	Subgroups
Web surveys	50	representatives from mobile operator companies, banks, independent mobile payment providers, phone manufacturers, mobile application developers, mobile technology consultants, and usability consultants
Web surveys	97	potential users from various countries, age groups, genders, and occupations

Data collection method	Number of participants	Subgroups
Email, face-to-face and phone interviews	9	3 independent mobile payment providers 2 bank representatives 2 mobile operator company representatives 1 mobile application developer 1 mobile technology consultant
Face-to-face interviews	5	potential users from Sydney from various age groups, genders, and occupations
Focus groups	3 groups, 6-8 people in each	potential users from Sydney from various age groups, genders, and occupations

Table 4: Data collection methods and information about the participants

Each interview was different, and varied in time duration, depending on the emerging issues. It is estimated that some Web surveys might have taken participants only 10 minutes, while others who provided long and detailed answers must have taken much longer. In-person interviews, including face-to-face, phone, and focus group ones, lasted usually between half an hour and an hour. This mainly depended on the willingness of the participants to sacrifice a given amount of time. The industry participants were especially time-pressured.

Demographics, as will be discussed later on, did not emerge as relevant to mobile payment attitudes in this grounded theory and therefore are considered irrelevant here. This is not a statistical study and does not claim to be representative of the population; therefore, no percentages of various subgroups need to be presented. As Glaser (1998) points out, *"[...] this position flies in the face of the standard qualitative analysis which requires a rundown on the conditions and/or background of the research and the referral to face sheet data [...] as if they were obviously relevant [....] If a condition or a face sheet item is*

relevant, it will emerge as part of the analysis, otherwise ignore it." (Glaser, 1998, p. 148)

The study did include participants from various countries, age groups, genders, and occupations to gain a variety of perspectives, but not to be statistically representative. As an example, a screenshot is provided from the online survey manager that depicts a slice of the list of the user respondents' occupations; a similar slice is provided as an example of a range of ages (Figure 12).

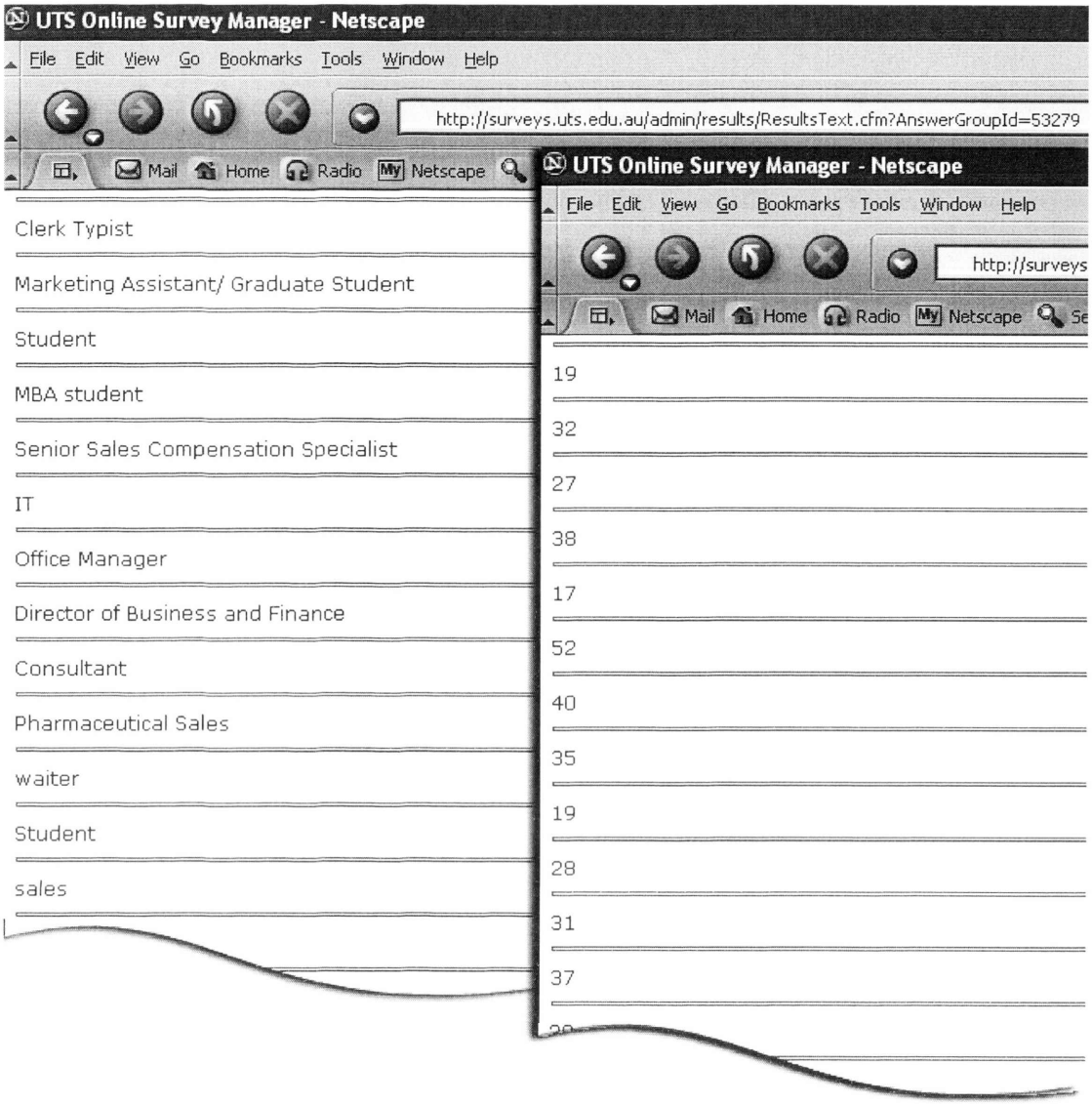


Figure 12: Screenshot of a summary of various occupations and ages of the participants

4.6 Data Storage and Organization

The data in this study, as recommended in the grounded theory approach, was coming from a variety of sources and methods. It was important to store and organize disparate data in an efficient way that would enable the researcher to conduct data analysis as soon as data collection started.

The data from initial online surveys were already available in digital form, and therefore, they could be easily stored on the computer. As was noted before, data analysis started immediately since this guides further data collection, including what and from whom to collect next. QSR NVivo (initially version 2, and then the subsequent upgrade, version 7), a program for qualitative data analysis that allows one to import and code textual data, was used in this project. The program enabled the immediate import of forthcoming data, dividing it into 'slices of data', and coding it into various themes. The emergent themes were guiding the subsequent data collection. The new data was constantly being imported into the program, and immediately coded into one or many themes. Such coding was by no means final, and themes and slices of data in them were constantly evolving. The details of the data analysis process will be explained in detail in the following Data Analysis Principles and Procedures chapter.

As mentioned earlier, the study moved from open-ended Web surveys to more focused in-person interviews to gather more data about each category or its property. Such face-to-face, phone, or focus group interviews were not recorded and transcribed, as recommended by the originators of grounded theory. Taping interviews collects too much data, more than theoretically necessary (Glaser, 1998). Actually, according to Glaser (1998, p. 107), *"one of the strongest evidentiary invasions into grounded theory is the taping of interviews."* Unlike

other methodologies that need transcribed interviews and descriptive completeness as complete evidence for verifying a finding, the use of interviews in grounded theory is for conceptualization or for generation of concepts and hypotheses (Glaser, 1998). Researchers should rely on notes written down after interviews, and data that is relevant will be remembered through associations during the constant comparison method (Glaser, 1998). Collection by taping ignores theoretical saturation of categories and their properties. Taping and transcribing slows down the research, and it makes it harder to analyse data while it is still collected. In grounded theory, data must be available for analysis immediately, since this analysis influence further data collection (Glaser, 1998).

Instead of taping therefore, the researcher relied on extensive notes taken during and immediately after the interviews. During the interviews, direct quotes were sometimes noted too if they seemed to explain or represent some concept well. The notes were typed and fed into the NVivo program as soon as practicable after the interview took place. They were then divided into 'slices of data', and coded into themes in the same way as the data from open-ended Web surveys was. The program stores new data in data sets, which made it possible to record each set's source details; even though 'slices of data' were later assigned to various themes, it was still possible to look up the source of each slice of data.

This section mainly described how the data was stored and organized in the NVivo program, whereas the process of how the coding progressed is explained in the following data analysis chapter.

4.7 Ethical Considerations

Since this research involved people, ethical aspects had to be considered. All the ethical issues that could arise from this study had been addressed before data collection started. The ethical application regarding this study was approved in September 2004. Such an application required providing a detailed research design, and answering, in detail, numerous questions about various ethical issues. If there is any ethical issue arising from a study, the Committee points it out and requires every issue to be addressed. The Committee members were satisfied with all the aspects of this research. They had initially requested two minor improvements to the research design, and after these were addressed, the final approval was granted. The corrections only involved informing participants that withdrawal can be done at any time without providing any reasons, and explaining to them what exactly the study will require from them.

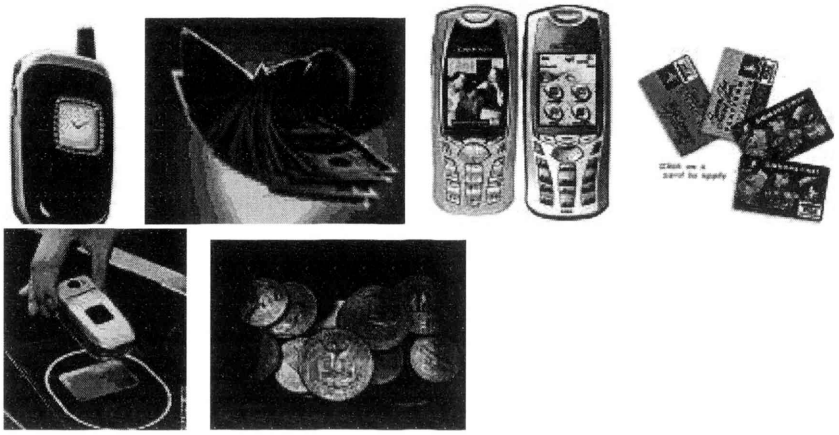
When using Web surveys, the answers remained completely anonymous, and no IP or email addresses were used to identify the participants. Their identity therefore was not known even to the researcher. In such cases, no ethical approval was even necessary; however, these studies were included in the ethics application as well, to make sure that all possible ethical issues were addressed. In face-to-face and telephone interviews, the researchers were able to identity the participants, their names however were kept confidential. All the field notes that were not anonymous were de-identified, and the codes are stored separately from the data fed into the NVivo, in files protected by passwords. The only information fed into the program storing the data was the assigned initial of the participant. All the participants were informed that the results of the studies can be published in a form that does not identify them in any way.

All other Ethics Committee guidelines were followed as well to ensure that the application was accepted. Each study included a consent page informing participants of the objective of it, what it involves, and it also informed them that they can quit the study at any time without giving any reasons. Web surveys and email interviews included links to the supervisor's and the researcher's home pages, email addresses, information about what the research is about, and the like. Participants were also encouraged to contact the researcher if they needed some more clarification about the project (see Figure 13 on the following page). As far as company interviews are concerned, the questions used had been carefully selected so that no confidential company information was elicited, and no private data about employees was collected.

Using Mobiles to Pay

Introduction

This survey is part of the research undertaken by Agnieszka Zmijewska for her PhD in Computing Sciences at the Faculty of Information Technology, University of Technology Sydney, under the supervision of A/Prof Elaine Lawrence. The survey consists of only four open-ended questions so please take as little or as much time as you would like. Your answers will help us to discover how mobile devices could be used in new payment systems to overcome disadvantages of current payment procedures.



If you wish to withdraw from the study for any reason, you may simply quit the survey by closing your browser window. Your replies will remain completely anonymous (not even your IP address will be sent to us). The research data gathered from this project may be published in a form that does not identify participants in any way. Thank you very much for your contribution. Please email Agnieszka at aga@it.uts.edu.au with any questions or comments about this research, or if you would like to receive a copy of the conclusions of the study.

Next Page > Page 1 of 3

Figure 13: Screenshot of the first page of the users' Web surveys

As the Ethics Committee Chairperson commented in the response to the ethics application, "*at its meeting held on Tuesday 14 September, the UTS Human Research Ethics Committee considered the above application and commented that it was well written, and important research.*"

4.8 Chapter Review

This chapter commenced with the description of the main data collection methods in this study: open-ended surveys and interviews. These methods were particularly suited to obtain rich, in-depth information about personal perceptions that would help understand contexts and causation within the topic of the study, mobile payments. A mix of interview methods was used to obtain as many various perspectives as possible.

The data collection process was guided by theoretical sampling, which means that all the decisions about what data and where to collect it next were guided by the emerging themes, and it was a constantly evolving process that responded to new issues that kept emerging in the study.

The respondents in this study consisted of a) industry stakeholders, including representatives of financial and banking institutions, mobile operators, third-party mobile payment system providers, phone manufacturers, mobile application developers, mobile technology consultants, and usability consultants, and b) potential and existing users, including consumers and merchants. The first group was sharing their experiences about mobile payment system initiatives, and the latter was providing insights about their issues with existing payment procedures such as cash, credit and debit cards or cheques, and their views on using mobile devices to make payments. All the questions were chosen

in terms of their relevance to the overarching research aim of discovering success factors that would help improve adoption and diffusion of mobile payment systems.

The data collection with both industry participants and users started with the method with the widest reach (Web surveys) and most general questions to generate as many initial categories as possible, and moved on to more focused research in later stages (in-person interviews) that were used to provide more depth and richness to the data so as to densify and saturate the categories. The personal interviews varied depending on the availability and preference of the participants, and could include face-to-face, phone, or email interviews; focus groups were also conducted with potential users. The data collection process finished when theoretical saturation was reached, which meant that new groups of participants were not producing new data that would add new concepts to the theory. The QSR NVivo program was employed in this project to store data and code it. Various ethical concerns were addressed during all the interviews.

As this chapter revealed, large amounts of data were collected in this study, from a variety of perspectives. These data were analysed as soon as practicable to guide further collection, and this analysis was based on very specific, grounded theory procedures, which are the focus of the following chapter.

5. Data Analysis Principles and Procedures

While the previous chapter explained the details of the data collection process employed in this study, this section provides a description of the data analysis procedures that happened simultaneously to the data collection. The chapter begins with an overview of a coding process in general, and then proceeds to provide specific coding techniques used in this study. The detailed recommendations of the grounded theory methodology authors (Glaser & Strauss, 1967) are followed. The chapter explains concepts relevant to both open and selective coding, including constant comparison method, categories, properties, core category, or memos. Both substantive and theoretical coding stages are explained, with a number of relevant examples from the study. The degree of computerization of the data analysis process is also discussed.

5.1 Coding Process Basics

Data analysis in qualitative research manages words, language, and the meanings that they imply (Miles & Huberman, 1994). Researchers need to not only manage huge amounts of data as texts, but these texts additionally have multiple meanings, at both the individual and social levels (Walker & Myrick, 2006).

Coding, as described by Boehm (2004), means deciphering or interpreting of data and includes the naming of concepts and also explaining and discussing them in more detail. The coding procedure (Auerbach, 2003) is based on the following steps: a) identifying relevant text; b) from the relevant text, discovering repeating ideas; c) organizing repeating ideas into themes, and d) organizing themes into larger, more abstract ideas – theoretical constructs. Strauss and Corbin (1998) define coding as conceptualizing, reducing, elaborating, and relating.

The grounded theory methodology, and therefore this study, is based on theoretical coding as a data analysing procedure to develop a theory based on the textual data (Glaser & Strauss, 1967; Auerbach, 2003). Theoretical coding makes it possible to ground hypotheses in the data gathered from participants (Auerbach, 2003).

The high level of development and the specificity of the coding process in the grounded theory methodology are what distinguish grounded theory from other qualitative methods (Walker & Myrick, 2006). Coding in grounded theory is not just a part of the data analysis stage, but it is a fundamental analytic process (Corbin & Strauss, 1990).

The coding of data analysis process has also been a cornerstone of the Glaser-Strauss (the co-originators of the grounded theory methodology) debate. While both Glaser's and Strauss's versions of grounded theory use coding, constant comparison, theoretical sampling, memos, and many other common concepts, one major difference is the issue of "forcing versus emergence" in relation to coding process (Walker & Myrick, 2006). Strauss and Corbin (1990, 1998) propose complex procedures, tools, and matrices to be used in grounded theory research, while Glaser (1992) advocates a total immersion in the data, where a constant comparison method will make categories emerge, and *"that is all there is to it"* (Glaser, 1992, p. 42). Glaser believes that Strauss's version is too automatic, and the forced coding imposes preconceived frameworks on the data (Glaser, 1992).

Walker and Myrick (2006) suggest exploring the differences between Glaser's and Strauss's perspectives to understand the arguments that can help researchers make informed choices about how to carry out grounded theory; this proposition has been followed while making methodological choices for this thesis. After a thorough exploration of the differences between the two grounded theory versions, the following stance has been adopted. Glaser's (1992) grounded theory seems to provide more guidance for every stage of the research process to the author of this thesis who has carried out a grounded theory investigation for the first time. This study also adopts Glaser's warning against over-reliance on the automated processes, forced coding, and imposing frameworks on data. Not relying on automated tools but rather on total immersion in data will ensure that a theory, instead of being forced on the data, will emerge from it.

5.2 Substantive Coding

Glaser (1978) has divided coding into two distinct phases: substantive and theoretical one. The coding in this study, accordingly, followed the same division. Substantive coding is concerned with producing categories and their properties (Walker & Myrick, 2006). It starts with reading the data notes line by line and comparing the unit of comparison: the incident. The incident can be found in a phrase or in a sentence, and rarely in whole paragraphs (Glaser, 1998). As recommended by Glaser (1998), the author of this thesis focused on such detailed incidents, not on the overall impression after holistic readings of surveys answers and interviews. Incidents generate codes (categories and properties); each code therefore has a set of empirical indicators, specific pieces of data that denote this concept (Glaser, 1978). This provides the necessary link between data and concept. A piece of data, for example, that denotes the concept of *Ability to try* is one of the participants' answer to the question whether he would be interested in using his mobile phone to pay: "*I would have to try it out.*" As another example, the concept of *Devising suitable revenue models* has, as one of its empirical indicators, an industry participant's comment about the importance of "*a profitable revenue sharing model between all players.*"

This constant comparison method is the basis of the substantive coding and analysis in grounded theory. It is based on the assumption that researchers, when comparing one 'incident of data' to another incident, will begin to see a pattern; this pattern will be named in a category (Glaser & Strauss, 1967). The method will be further described in the following sections.

Open coding

Substantive coding is further divided into open and selective coding (Glaser, 1978). Open coding is the initial stage since it involves coding the data *"in every way possible... running the data open"* (Glaser, 1978, p. 56). The initial analysis in this study therefore involved line-by-line analysis of all data, coding data into as many ways as possible and writing memos about emerging ideas (Glaser, 1978). The data was initially coded for as many categories that might fit, and the most relevant and workable categories started to emerge (Glaser, 1978). Patience and persistence require going over and over the data so that categories and properties may start to emerge (Walker & Myrick, 2006). The main advantage of open coding, according to Glaser (1978), is that it allows the researcher to see the direction where to take the study further by theoretical sampling, before the process becomes more selective and focused on a particular problem.

As recommended by Glaser and Strauss (1967), when an incident was coded for a category, it was always compared with the previous incidents in the same category. Such comparison of indicators was based on analysing differences, similarities, and degrees of consistency of meanings between the indicators, which resulted in the emergence of underlying uniformity between them, and through that - categories. All data can be subsumed as an indicator of some category (Glaser, 1978).

Such constant comparison of the incidents soon started to generate properties of the categories, too. An incident therefore would either indicate a category, or a property of a category. Some of the properties were dimensions, types, processes, or relations (Glaser & Strauss, 1967). A category is a higher level concept than a property, capturing the underlying patterns in the data. A property in turn is a concept about the category (Glaser, 1998). An example of a

category that emerged in this study is *Consumers' adoption factors*; this category has a number of properties, such as *Ease of use*, *Low cost*, or *Ubiquity*. As another example, another category is *Understanding players' strengths and capabilities*, and it includes such properties as *Banks' trust*, or *Mobile operators' existing infrastructure*.

The open coding process was helped by asking the following questions about each incident of data, as recommended by Glaser (1978):

- What is this data a study of?
- What category/property of a category, of what part of the emerging theory, does this incident indicate?
- What is actually happening in the data? What is the basic problem in the action scene, and what is the basic process that processes the problem?

The naming of both categories and properties was a developing process since, as pointed out by Glaser (1998), names should emerge incident after incident, not be based on just one incident. An example of a category that had a name changed after more incidents of data were coded into it is *Available features of devices*, which initially was coded as *Advancement of devices*. *Cost*, for example, became *Low cost* when it became clearer that it is the necessary condition that providers need to fulfil.

While categories and their properties were emerging, incidents were also being compared to the properties of categories, which lead to discovery of relations between some categories and their properties. Each incident was therefore compared not only with other incidents, but also with properties of a category, in terms of as many similarities and differences as possible. This revealed some

categories in terms of their changing relations to other categories; some categories then became integrated with others (Glaser & Strauss, 1967). *Security*, for example, was divided into two categories, *Security* and *Trust/Confidence*, when it became evident that apart from providing a secure system, mobile payment providers need to also convince users to trust them that the system is secure. *Convenience* that initially was coded together with *Ease of use* revealed itself as a very important separate property since users seemed to have very different things in mind when discussing convenience and ease of use. *Other payment systems*, while initially coded as a category, became a relation of the *Consumers' adoption factors* category when it became clear that the importance of other payment procedures is mainly in terms of a new mobile payment system being compared by users to their existing ways of paying. The theory started to emerge when fewer and fewer modifications were required when comparing new incidents.

Selective coding

The second stage of substantive coding, selective coding, begins when researcher moves from running the data open to delimiting the coding process around a core category (Glaser, 1978). The core category emerges as the main theme, or the main concern or problem for the participants in the setting (Glaser, 1978). A core category can be discovered, according to Glaser (1978), because it is the central category that proves to be related to as many other categories and properties as possible, reoccurs frequently in the data, it takes more time to saturate, it relates easily to other categories, and it is very variable, that is changes dependent on the conditions (Glaser, 1978). The core category shows what is going on to relieve the participants' main concerns, or in other words, it explains how the participants resolve their main concern, or how they handle it (Glaser, 1998). Similarly, in this research, one of the categories emerged as core:

it was consistently related to many other categories (Glaser, 1998). Selectively coding for the core category meant that it was delimited only to those variables that related sufficiently to the central variable.

The core category emerged as the *Providers' Understanding of Contexts and Fulfilling of Conditions*. All other categories in this study are related to the core category, as they represent Contexts and Conditions that must be understood and accounted for by mobile payment providers in order to launch successful initiatives. The core variable guided further data collection and theoretical sampling (Glaser, 1978). The advantage of selective coding is that the researcher may focus on the analysis of one core variable with all the conditions and consequences that relate to it, but still within the total context developed during open coding (Glaser, 1978).

Computerization issue

The whole substantive coding process was performed in the NVivo program, as mentioned in the preceding Data Collection Principles and Procedures chapter. The program was used to import and store data with demographic details of the source, and to code slices of data into various themes. Such themes later on became categories, properties, or relationships in the emergent theory.

Glaser (1998) warns against over reliance on computerization, and this stance has been followed in this study. The program was mainly used as a way of storing and coding large amounts of data that were often already available in digital form anyway (Web surveys and email interviews). The researcher also preferred to type in all the field notes immediately after in-person interviews so that all the data from various sources could be analysed together. Additionally, the researcher who grew up with the computer as an everyday tool for work and

play found it much easier to manipulate data in digital form. While Glaser (1978, 1998) recommends using hand-written notes, the researcher worked much better using a mouse to select the relevant text, and the drag-and-drop technique to place it into the category to which it seemed to be relevant. It was also easy to move the relevant text out of a category, move it to a different category, or code it to several categories at once, which was especially important in the initial open coding process. The program's various panels that provide, for example, a list view of all the categories and their properties made the analysis easier for the researcher, allowing a better grasp of all the various codes and how they fit together. The following Figure 14 illustrates how a piece of data would be coded by the drag-and-drop technique into the *Advancement of Devices* category (later changed to *Available Features of Devices*).

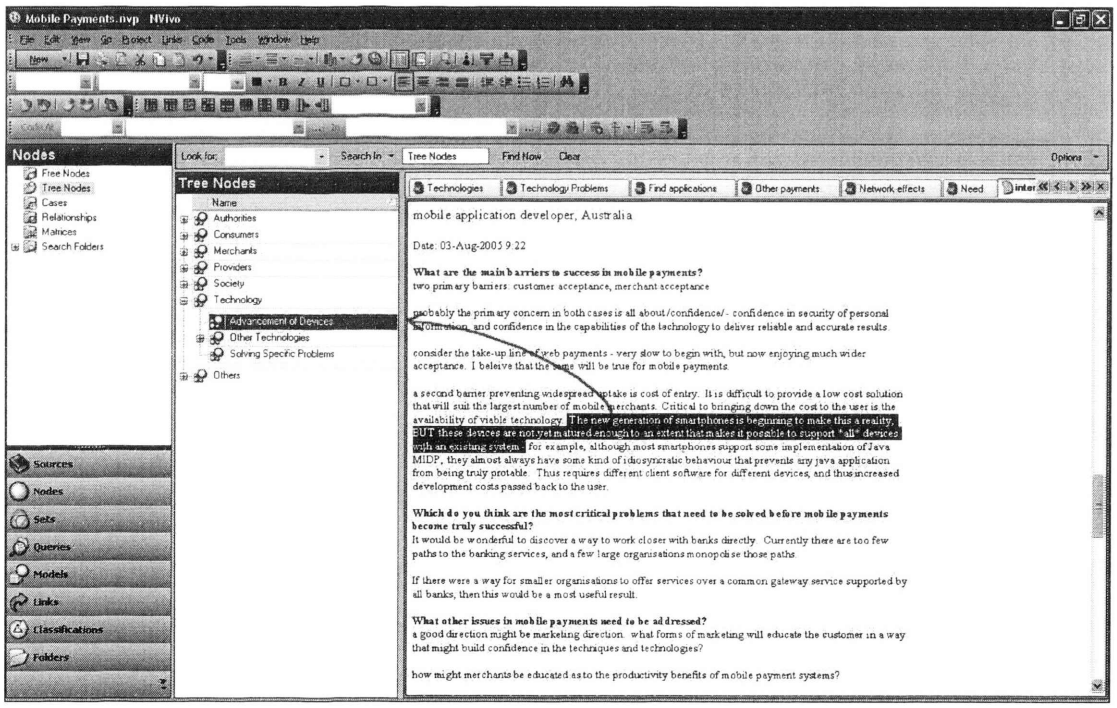


Figure 14: Coding a piece of survey data into a category using the drag-and-drop technique

The NVivo program uses so-called tree nodes to create categories, where each parent node can have a number of child nodes; this meant that properties belonging to the category could be easily added, and the whole tree node structure, or, in other words, categories/properties structure, was easily seen in the List View (the second column from the left in Figure 14). Since the categories and properties evolved constantly as recommended in the grounded theory process, it was also easy to drag and drop nodes to move them around the hierarchy.

As recommended by Glaser and Strauss (1967), memos were used extensively during the coding process to note down emerging logical conclusions about each category. A memo can be a sentence, a paragraph, or a few pages (Glaser, 1978). Each memo was given a title which was the category or its property with which the memo was concerned (Glaser, 1978). Memos were kept separate from data, as recommended by Glaser (1978). While Glaser and Strauss (1967) and later Glaser (1978, 1998) describe hand-written memos, the researcher found the concept easily adaptable to a digital format, while still realizing all the advantages of a memo writing process. The use of memos documents the analyst's ideas as coding proceeds, and is a very important part of the coding process in grounded theory (Walker & Myrick, 2006). Memos made the researcher gradually develop ideas and concepts, and provided a constant point of reference. The NVivo program provided a folder where all the memos could be stored, easily accessed, and modified. The following screenshot (Figure 15) depicts a memo used for the category to which the text was coded in the preceding example.

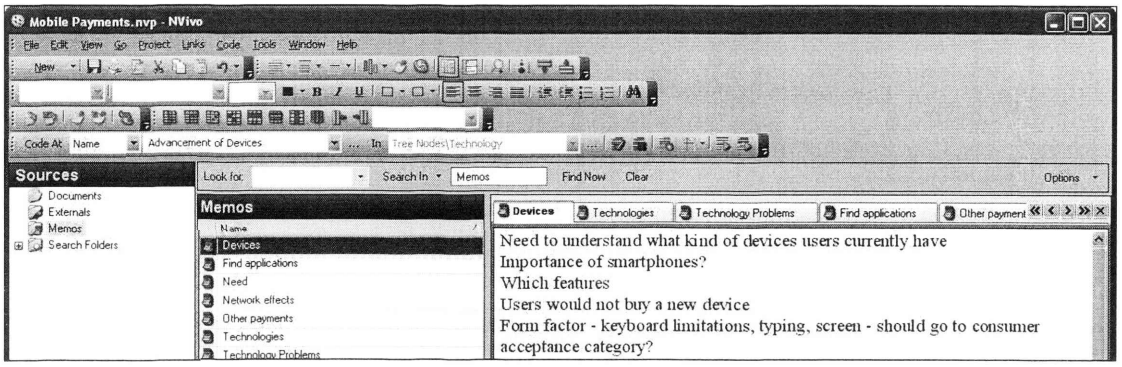


Figure 15: A memo example in NVivo

Over-reliance on computerization was not an issue since the NVivo software was merely used to perform tasks and techniques recommended by Glaser and Strauss (1967) and Glaser (1978, 1992, 1998), but in digital form with which the researcher feels much more at ease. NVivo offers more advanced features that were not used in this study because the researcher did not want the process to become too automated. Such NVivo features as automated coding by heading level, auto coding by paragraph, or assessing of relationships were never used. Reading the data line by line was always preferred to searching by keywords. The whole coding process therefore was conducted manually, using the program to organize and manage data more efficiently, but without letting the computer take control over the process. The whole method mirrored closely the guidelines and procedures recommended by the authors of the methodology, Glaser and Strauss (1967), and later Glaser (1978, 1992, 1998); the procedures were simply conducted in digital form because of the personal preference of author of this thesis. The final screenshot in this chapter (Figure 16) presents how the researcher could easily see all the relevant text coded to the specific category.

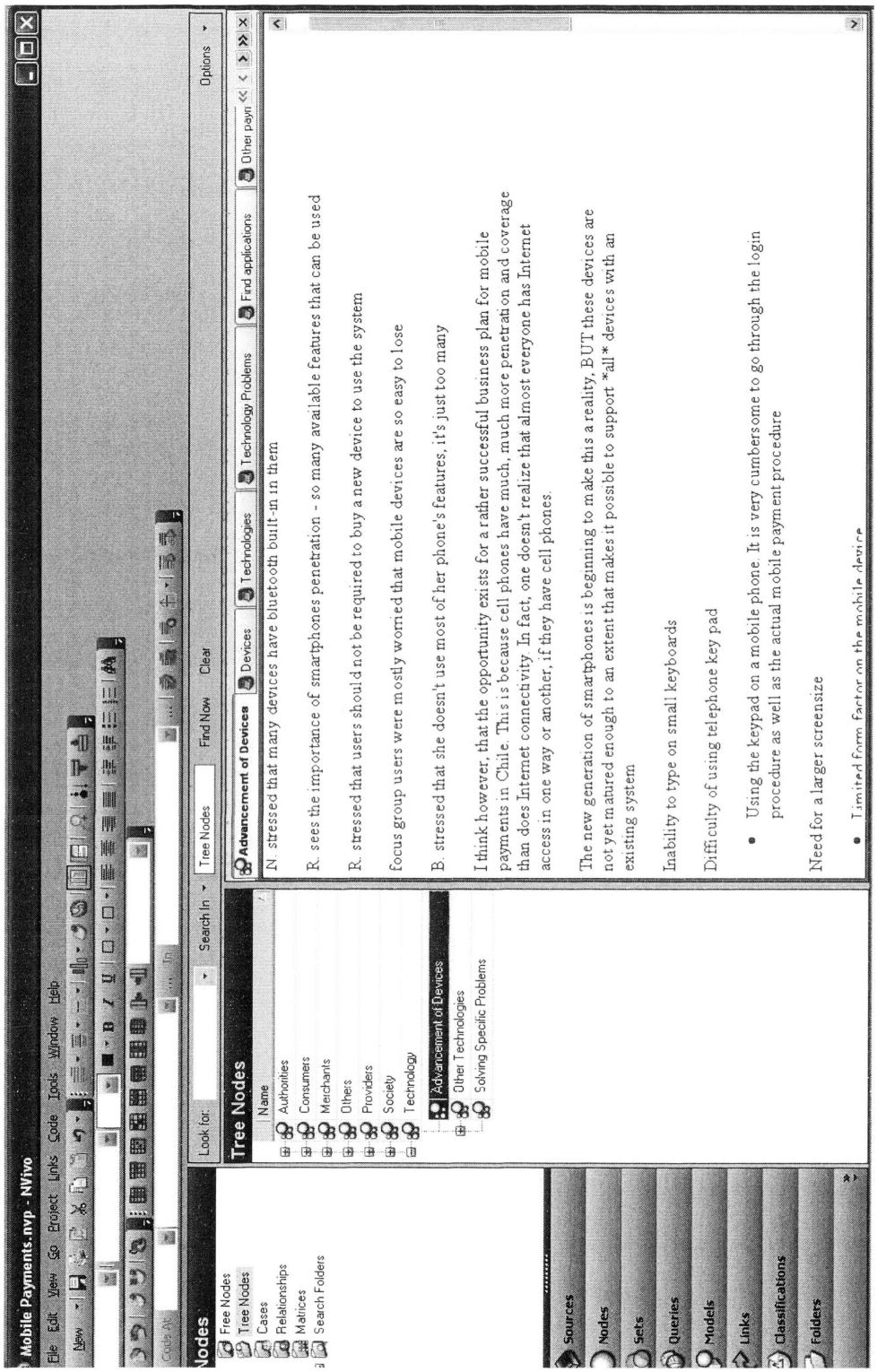


Figure 16: An example of a category code with all the relevant text that has been coded into it displayed on the right-hand side

5.3 Theoretical Coding

While substantive coding is used to generate categories and their properties, theoretical coding occurs at conceptual level, weaving the substantive codes (categories and properties) together into a theory (Walker & Myrick, 2006). It is the process of using theoretical codes to conceptualize how the substantive codes relate to each other as hypotheses that will be integrated into a theory (Glaser, 1978). If the first process, substantive coding, fractured and selected the data, then the theoretical coding is meant to relate and integrate it back, *"weave the fractured story back together again"* (Glaser, 1978, p. 72). It is the overall integration through sorting into a theory (Glaser, 1998). The theoretical coding in this study was, therefore, mainly based on developing hypothetical relationships between categories and properties (Glaser, 1978).

Theoretical sorting and integrating of memos is the key to formulating theory (Glaser, 1978). Sorting of the categories and properties was done by analysing similarities, connections, and conceptual orderings (Glaser, 1978). The categories and properties were only sorted as they related to the core category. The researcher found it easier to sort and integrate categories into a theory using a hand-written method; after all the categories and their properties were written down, it was a constant process of integrating them back and forth in every possible way, trying to find the best and the most relevant fit for the theory. Categories were resorted and reintegrated a number of times, and each time the researcher consulted both all the collected memos and data slices representing each category, to check the relevance and fit. The following Figure 17 depicts several attempts of trying to integrate categories and properties together in a theory.

Figure 17: Examples of attempts to integrate codes and properties into a theory

The sorting finally integrated the relevant categories and their properties into the emerging theory which seems to best explain the research problem, be relevant and fit, while at the same time being true to the collected data.

5.4 Chapter Review

This chapter explored the data analysis process employed in this study. It first shed light on the general concept of coding (interpreting of data and the naming of concepts), and then explored the very specific and developed coding process of grounded theory. Regarding the disagreement on the coding process between the co-authors of grounded theory, this study was based on Glaser's coding guidelines since they seem to focus more on generating theory that emerges from data, rather than being forced on data.

In the first coding stage the data was coded for as many categories that might fit to identify a multitude of open issues (open coding). While categories and their properties were emerging, a new piece of data was always being compared to all the identified codes, and before it was coded to a specific category, it was also compared with the previous incidents in the same category. This is referred to as constant comparison method. The codes were constantly evolving, and this chapter included examples of changes in category names or category/property relations.

The process then moved to selective coding, which means that it was delimited only to those variables that related sufficiently to the core variable. The core category emerged as *Providers' Understanding of Contexts and Fulfilling of Conditions*. All other categories are related to the core category, as they represent contexts and conditions that must be understood and accommodated

by mobile payment providers to improve adoption and diffusion of mobile payments.

The open and selective stages together are referred to as substantive coding. The NVivo software was used to manage the whole substantive coding process. All the procedures and guidelines, including writing of memos, followed closely the grounded theory methodology, and the program was used simply to perform the procedures in a more efficient way that suits the style and preference of the researcher; the coding was done manually, however, not using any automated tools.

The final data analysis stage involved theoretical coding, which is the overall integration of all the codes through sorting into a theory. This evolving and iterative process was done by hand. It resulted in a theory that seems to best explain the research problem, while at the same time staying true to the collected data. This theory is presented in the following chapter.

6. Emerging Theory

The rigorous data collection and analysis procedures, described in detail in the previous chapters, have led to the forming of an emerging (but not yet final) theory. In this chapter the concepts of theory and theoretical codes are discussed first. Afterwards, the basics of the emerging theory are explained, followed by a visual model that depicts the mobile payment success factors identified in the research; the theory is then described in a narrative structured around the proposed categories and their properties. As recommended in the Rigour and Quality of Research chapter, numerous representative quotes are used extensively to evidence the emerging theory.

6.1 The Concept of Theory

Theory, as argued by Strauss and Corbin (1998), is a set of well-developed themes and concepts that are systematically interrelated through statements of relationships to form a theoretical framework that explains some relevant phenomenon. These statements of relationships explain who, what, when, why, how, and with what consequences an event occurs. Theory therefore is more

than just descriptions. In making theory, not only are events and happenings described, but the analysis is extended to involve interpretations as well to explain why, when, where, what, and how events or happenings occur (Strauss & Corbin, 1998). To explain or predict, theoretical statements are needed that form connections between two or more concepts. Well-developed themes are connected to form an integrated theoretical scheme. Theorizing means not only conceiving ideas (concepts) but also formulating them into a logical, systematic, and explanatory scheme (Strauss & Corbin, 1998).

This chapter presents the results of the data analysis in this study integrated in such a logical, systematic, and explanatory scheme. This theoretical framework represents the identified factors that influence adoption and diffusion of mobile payments. The theory integrates numerous categories, properties and relations between them, and the theory presentation in the following sections is organized around these building blocks. Instead of just listing the elements however, for each category, rich and in-depth illustrations are provided along with numerous evidence quotes from the participants. This results in a set of detailed guidelines and practical recommendations on how to maximize the chances of successful implementations of mobile payment systems. It must be noted that such quotes do not represent all the textual data coded to a specific category, but rather certain quotes which have been chosen as being the most representative of specific attitudes and opinions.

6.2 Basics of the Emerging Theory

The success factors in the theory are organized around six perspectives. The six groups - *Providers, Consumers, Merchants, Society, Technology*, and *Authorities*

– are the ones that have been proven in the collected data since all the identified categories belonged to one of the six perspectives.

The core category, as explained in the preceding data analysis chapter, emerged as the main theme, or the main concern or problem for the participants in the setting (Glaser, 1978). *Providers' Understanding of Contexts and Fulfilling Conditions* has emerged as the core variable that can influence the main problem of improving mobile payment systems. All their categories in the six perspectives are related to the core category, as they represent contexts and conditions that must be understood and accounted for by mobile payment providers in order to improve adoption and diffusion of their systems. All other success factors therefore are related to the core category of *Providers' Understanding of Contexts and Fulfilling Conditions* within the perspectives dealing with *Consumers, Merchants, Society, Technology, Authorities,* and *Providers* themselves.

The following Figure 18 represents the theoretical framework as it emerged from the data analysis in the form of a visual model. The following sections will explore each category and its property in detail.

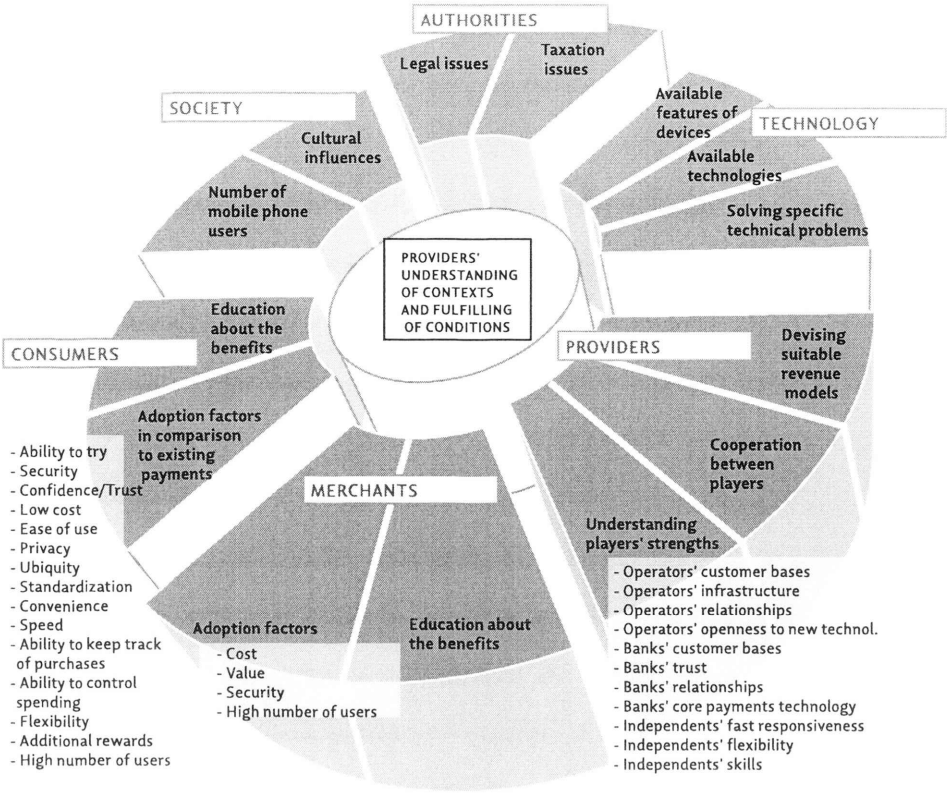


Figure 18: Proposed model that has emerged from data analysis

The categories in the theory represent (Causal) Conditions and Contexts. Glaser (1978) lists 18 coding families that researchers may use to integrate the categories that emerged from the data into a theory as hypotheses. They are flexible families that aim to sensitize researchers to numerous possibilities they can choose for their codes. A review of all the families (some of which include, for example, co-variances, ranks, limit, range, probability, level, division, kinds, styles, purpose, goal, agreements, conflicts, or social interaction) found the contexts and conditions codes (Glaser, 1978) as being the most suitable to this theory that essentially focuses on factors influencing adoption and diffusion of mobile payments. Glaser places the contexts and conditions in his 'Six C's' family

(Causes, Contexts, Contingencies, Consequences, Covariances, and Conditions), and sees the family as *"the bread and butter of theoretical codes,"* and *"the first theoretical code to keep in mind when coding data"* (Glaser, 1978, p. 74).

The difference between contexts and conditions is often subtle. In this study contexts are more passive, so they cannot be directly influenced by providers – it is however very important for them to understand the contexts and take them into account when implementing new systems. Conditions need to be not only understood, but they also can and should be influenced by providers if they want to implement successful solutions. Laws regarding mobile payments are a context that needs to be understood and complied with, for example, but solving specific technical problems is a condition that needs to be fulfilled.

6.3 Providers

The first perspective to be discussed, *Providers*, includes three success factors: devising suitable revenue models, cooperation condition, and considering the strengths, or, in other words, capabilities of each party (mobile operator, bank, and independent company) in such co-operations. The categories and their properties are discussed below.

Devising suitable revenue models

The issue of revenue and business models has been brought up by a number of industry participants. In the mobile payment field, there exist "*complicated revenue models involving more than one business entity.*" Models are needed that *"would satisfy all the stakeholders involved"*, and would provide *"a profitable revenue sharing model between all players."* For widespread adoption, *"finding the right business model"* is necessary, and "*the right business models must be*

developed for different types of mobile payments." Nowadays, according to the industry participants in this study, existing models are inefficient.

The important questions therefore are: *"What is the value chain?"* and *"Who will get what from this new value chain?"* There needs to be a *"demonstrable value for banks, telcos, and merchants so that they do not end up eating each other's lunches."* The key question remains: *"How can different players extract value from this area without 'killing the golden goose'? If too many people try to make a buck from this, then the cost will get passed on to the customer and they won't use it!"* Therefore, *"the system needs to be cost effective for all involved."*

New revenue sharing models need to be created especially for tangible products, as the existing models for the sales of intangible products, such as ring tones or games, mean that *"the carriers are used to having a profit margin that is totally unrealistic for tangible products (i.e. 50% of the transaction)."*

Another third-party provider from Australia noted that the *"problem to be overcome is the current revenue share model for premium SMS services. Telcos take far too much of a revenue share (approx 35%) which does not allow significant margin for applications to be sold via this channel."* Others also mentioned the premium SMS issue: *"The barrier is the percentage of the transaction that operators take out of the payment when using premium SMS."* Again, in Australia, an independent provider commented about a mobile operator: *"If Telstra are [sic] a player, it is likely they will try to take the lion's share of the payment amount in 'commissions'..."* More comments about the revenue sharing included: *"Anything that is plugged into the networks (that doesn't mean that they need a banking license) runs into their Cap.Ex.* [Capital Expenditure] *requirement to get around 40% return on capital (hence terrible*

premium SMS transaction costs). The success of premium SMS (even at a 30-40% cost of transaction) shows what a tremendous latent demand there is from consumers for mobile payments."

Devising suitable revenue sharing models by providers for their mobile payment services has proven to be one of the crucial success factors. Providers need to devise a revenue model for their service that would be profitable to the various parties involved; especially the existing models used for intangible products, in particular, those based on premium SMS, are inefficient. Providers need to devise suitable revenue-sharing models both for tangible and intangible products.

Cooperation between players

Cooperation between the players has emerged as another necessary condition for improving adoption and diffusion of mobile payment implementations. Currently, as one respondent put forward, *"the main barrier to success in mobile payments is the lack of cooperation between banks and telcos."* There is *"a lack of business agreements between all involved parties."* This issue is believed to be a significant barrier to success, mainly the *"behaviour of (potential) mobile payment service providers, especially mobile operators and banks."* There is also *"a lack of market support from network operators and financial institutions."* Nowadays, *"any mobile payment service tends to slice up the market because not all participants are involved. As such, the early majority merchants and consumers stay away."* If there is no cooperation, as a respondent predicted, *"mobile networks will stifle growth in this area by trying to take a slice of the value chain."* Cooperation needs to replace the *"protectionist practices by the established providers of networks (carriers), terminals (mobiles & EFTPOS), banks (national and international) and card schemes. Each party seeks to grow their market share by providing 'entry' to their contributing or owned partners.*

Technical and commercial initiatives are discouraged by the list of barriers within each industry group." As an independent provider argued, *"it would be wonderful to discover a way to work closer with banks directly. Currently there are too few paths to the banking services, and a few large organisations monopolise those paths."* Another expert claims that *"the strong position of banks and credit card organisations, who rule the market, hinder success of new market entrants."*

Currently, according to an independent mobile payment provider, both banks and operators *"have too much of a vested interest in their own business (banking licenses/spectrum) to successfully partner with each other or an independent. They see all other organizations essentially as a threat in payments."*

Numerous participants emphasized that this situation needs to change, and saw the cooperation between the players as the necessary success condition. *"An agreement between the businesses involved"* is an important issue. *"Collaboration between the financial institutions and the telcos"* is necessary, and the banks and operators need to *"find a way to commercially work together to provide an industry wide service."* What is needed, according to a mobile operator company respondent, is *"bank and telco cooperation to create a single set of interoperable cross-bank and cross-telco scheme rules." "Collaborative open business models"* are the key to success of mobile payments, according to another informant.

As similarly expressed by many participants, *"both operators and banks must act cooperatively together to make the market sustainable and valuable to all. And there is a role for each to play."* To sum up, *"there is an appropriate and happy position for both industries (telcos and banks) to gain value. However, it is going to be some time before this is found."* According to many respondents, it is clear

that *"banks and telcos need to work together."* The answer of an independent company respondent to the question whether collaboration is necessary for the success of mobile payments sums up these attitudes: *"Yes, yes, yes, yes!"*

Such collaborations would *"recognise the value and capabilities added by each party"*, and *"simplify the back end transaction flows, costs, interchange fees and backend infrastructure."* Additionally, collaborative models would also "*bring the product to market quicker"*, help with *"standardisation, industry compatibility and reduced risk"*, and would *"accelerate user acceptance and credibility"* since mobile payment systems would be easier to brand.

Models where an independent company would not partner with a bank or a mobile operator have failed in the past, as pointed out by some participants, for example: *"If an independent company will develop the service and launch it - and the company will need a lot of money to develop and advertise the service so that people would use it - similar attempts have failed in the past due to lack of adoption (beanz, PAYbySNAP, and others)."*

According to one provider of a payment system for mobile merchants, the key inhibiting factor for the company has been establishing partnerships with the banks. The company initially had difficulty convincing banks to trust their security system. A company interviewee believed that Australian m-payment providers are *"inhibited by the banks"* who see them as potential rivals to their own financial viability. Another participant believed that Australia and the United States are well behind Europe and Asia because of the lack of cooperation between mobile payment providers and financial institutions. He felt that the telecommunication providers *"were much easier to partner with"* as they did not see the independent providers as competitors but as partners.

Another mobile payment company representative stated that banks are both opportunity and road block for them. Banks have large number of customers and if customers or merchants ask for the mobile payment solution, then the banks will utilize this system. The participant also expressed a view that the company's greatest opportunity is in building up partnership with banks.

A specific model based on cooperation, proposed by one participant, includes a separate business being set up, with equal shareholders between the bank, carrier, and third party. *"The business needs a board with an independent/strong chairman. The business needs a CEO who is independent. The business needs detailed/well defined service level contracts with all three parties. The business needs sufficient capital to remain focused for at least three years to make it work. Each of the three parties needs a service level manager who will own the service level contract. His job needs to be on the line in regards to having the service level met by his parent organization. The service level contract has to be owned by each party's executive management team."*

According to another independent respondent, a model likely to succeed could be one either backed by a bank or a mobile operator, and not necessarily both. This would ensure that the company has *"the strength and financial support to sustain the model until a critical mass of users adopt the service, and it would be simple for users to understand because it would be endorsed and marketed by their existing bank or telco (big brands)."* What is more, *"similar models have succeeded in the past, e.g., bpay."*

One independent provider believed that *"ideally a mobile payment solution should be operated by a third party without a telco interest, but with a significant market power in terms of obtaining customers."* Another third-party provider

also proposed that the successful model would be one dependent on *"payment methodology not involving the carriers and not requiring pre-registration (a la PayPal)."* Some other respondents also recommended such *"non-operator driven payment solutions - that only use the operator as a carrier."* An independent provider also believed that *"if there were a way for smaller organisations to offer services over a common gateway service supported by all banks, then this would be a most useful result."*

Additionally, another independent system provider recommended that *"the ideal model for mobile payment is where the consumer can use their mobile phone to make payment directly from their existing banks accounts. Payments going back to the phone bill are not economic for operators except for a very small part of the market. Creation of new accounts to facilitate payment (e.g. in a PayPal model) is inefficient - although may ultimately be the successful model if banks and operators do not come together."*

Yet another proposed model involves a consortium of *"say approximately 20 high profile companies (non-telco and non bank) willing to sell products and services via m-payments who combine and agree on a standard, and fund an organisation dedicated to operating an m-payment service."* However the respondent still believed that the mobile operator or bank backed model would be more likely to succeed.

To sum up, the majority of respondents proposed cooperation between independent providers, banks, and mobile operators as the necessary condition for success. If all the three parties would not partner, other models that have been proposed are based on cooperation between independent providers and either banks or a mobile operator - some believe that there is room for both

"bank-centric versus operator-centric solutions." Mobile payments not based on collaboration and partnerships at all, however, are most likely to fail, according to this study's respondents.

Understanding players' strengths and capabilities

Mobile payment systems involve numerous stakeholders. The current study has identified mobile operators (telcos), banking institutions, and independent third-party providers as the potential mobile payment providers. The previous section revealed that the collaboration between these parties is a necessary success condition. In such collaborations, it is important for providers to understand what each party can offer, or in other, words, what each party's strengths and capabilities are that can be brought into the partnerships. The understanding of strengths and capabilities of each partner has emerged as an important success factor that needs to be understood and accounted for in devising collaborative models for mobile payments.

Mobile operators

According to the respondents, mobile operators are *"perfectly placed to market m-payments to existing customers."* Mobile carriers have *"natural synergy with existing mobile business."* Other strengths of mobile operators as partners in mobile payment initiatives include, according to the participants, the following: they already reach nearly everyone, wireless infrastructure is already in place, they are open to new technologies, and finally, operators are big enough for such a business. Operators also "*are always in search of new business cases (since selling bandwidth is not enough)*", and *"m-payment service will allow telco to 'sell' higher value products and services through their 'channel'."*

Mobile companies also own spectrum licenses, have *"core communications technology in place in core locations"*, and a number of relationships in place. Moreover, *"operators believe that they own the channel and the customers, and see an opportunity to enter the space."* Operators may play a central role in the development of mobile payments, particularly *"if they take care of payment authentication and billing."*

An independent system provider, however, pointed out that operators are new to banking business cases, and may need to get a banking license. As well, they are still *"a bit frustrated because of the Universal Mobile Telecommunications System (UMTS) crash and heavy money loss"*, and they have already failed with unsuccessful and unsuitable models before. What is more, *"telcos do not have the focus or capabilities to drive the capability into the banking or business sectors."*

Both mobile operators and banks, according to some respondents, can be *"slow to move on business opportunities"*, have poor legacy technology that is difficult to change, and *"general lack of knowledge of technology and business applications hence poor decision making skills and poor implementation/project management skills."* Both of them also tend to focus their resources on *"compliance, upgrading core technologies and cost-reduction initiatives rather than on customer solutions."* Therefore, they can be seen as *"product, rather than solution focused"*, and *"cost, rather than revenue focused."*

This seems to confirm the importance of partnerships that would take advantage of mobile operators' capabilities but overcome the shortcomings mentioned above.

To sum up, the properties of this category include the following strengths of the mobile operators that they can bring into collaborative mobile payment initiatives:

- Operators' existing customer bases;
- Operators' infrastructure;
- Operators' existing relationships;
- Operators' openness to new technologies.

Banks

The strengths of banks as partners in mobile payment collaborations, according to the respondents, include that *"banks reach already nearly everyone"* nowadays, and they could market the m-payment service to their existing extensive customer base. Additionally, banks already have a number of relationships in place.

Payment is their core business, and they *"have core payments technology in place."* A survey response reveals that *"banks see payments as their space and are rightly nervous and cautious about operators taking it from them."* Banks *"dread the loss of control of the payments process."*

Banks also have trust and *"credibility which creates confidence in users."* Banking institutions also have *"financial resources to fund development and Research and Development."* Banks also do not need any new banking licenses.

A third-party m-payment system provider in this study observed, however, that *"the banks have few competent resources to drive the capability into the business sector."* Other respondents claimed that banks do not like technology changes very much, and they may be too big, too slow and too retrospective as

potential mobile payment providers. They lack *"innovation and the culture and drive to change to new payment methods."* The problem with banking institutions is that *"anything that uses the banking system faces years of negotiation in a traditional industry (banking) - difficult when mobile is such a fast moving industry anyway."* Banks traditionally are *"not into experimenting and taking risks."*

This lack of innovation culture in the banking sector highlights the importance of partnerships with independent providers or mobile operators, who, as revealed in respective sections, seem to be more open to new technologies and to change.

To sum up, banks can contribute the following to improve mobile payment implementations:

- Banks' existing customer bases;
- Banks' existing relationships;
- Banks' core payments technology;
- Banks' trust.

Independent companies

According to the respondents in this study, people may be reluctant to give more power and details to operators and banks, hence there could exist an opportunity for independent providers.

One of the participants pointed out that independent providers are fast to move on business opportunities, and their focus is rather more solution-based, than product-based, and rather more revenue-based, than cost-based. Such start-up companies can focus their resources on customers' solutions, and not on compliance, upgrading core technologies, or cost reduction initiatives. They have

up-to-date technology, which is also easier to change. Many respondents stressed that independent companies are *"more flexible"* and *"responsive to change."*

In terms of the target market, services involving independent providers could be *"applied across [the] entire industry and potential customer base, not just for a specific company's (bank or telco) customer base."* They could operate mobile payments as a service for many operators' networks.

Some respondents believed that independent companies are a necessary part of mobile payment partnerships, because, for example, *"without the skills, technology and speed of implementation capabilities of a third party, the service will not happen for a considerable period of time."*

Their weakness however, according to the respondents, is the lack of existing relationships, limited experience in the industry, and the lack of spectrum, banking license, or connection to the banking infrastructure, as well as *"no last mile service."* The lack of a brand name, trust and credibility as well as existing customer bases makes it extremely difficult for such providers to remain in the market. Such independent companies, therefore, need to partner with mobile operators and/or banks, who, as revealed in the previous sections, can offer exactly these capabilities.

To sum up, the strengths that independent companies may bring to partnerships as mobile payment providers include:

- Independent companies' fast responsiveness;
- Independent companies' flexibility;
- Independent companies' skills.

The following figure presents the categories and properties that are included in the *Providers'* perspective, as one of the building blocks of the emerging theory (Figure 19).

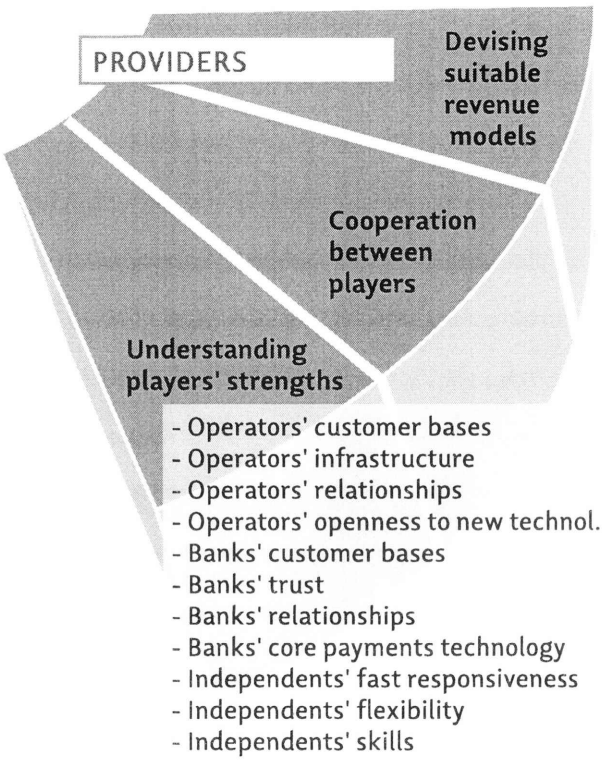


Figure 19: The Providers' perspective in the emerging theory

6.4 Consumers

The next perspective includes issues that deal with consumers of mobile payment systems. An important (grounded extensively in the data) category proved to be *Consumers' adoption factors*. The category has numerous properties, including *Low cost* and *Ability to try*, for example. Another category includes the necessary condition of educating the consumers on such benefits of mobile payment systems.

Consumers' adoption factors

Many industry respondents saw consumers' acceptance as the main issue in the success of mobile payments. They pointed out to the importance of discovering *"factors to increase wide-acceptance"*, and understanding of *"human behaviour/ acceptance of using mobile devices for payment."* Currently, consumer adoption factors do not seem to be taken into account enough when new solutions are implemented, as explained by one of the industry respondents: *"Most m-payment schemes tried to adapt to the existing laws and marketing situations and don't care for the needs of their customers."* Some participants suggested that what is needed is *"more surveys on what people want!"*, which confirms the importance of the current study that also involved needs of potential users.

Comparison to existing payment procedures

Existing payment procedures have a great influence on the success or failure of new mobile payment systems. This has been suggested both by potential users and industry experts, for example: *"Most of new systems don't offer any advantages over existing forms of payment, especially credit cards and cash - even when some of them do, then they have so many other drawbacks that people won't see any reason to switch to them because, for example, it's either*

too inconvenient or expensive", or *"What interests / excites end users to divert from existing payment instruments?"* Therefore, to create a successful solution, mobile payment providers need to know *"what other ways people do the payments now, and how would a mobile payment system benefit them"*, and they need to make clear *"the benefits of mobile payments over current systems that work just fine: credit cards, cash, checks, and others."* A successful m-payment solution needs to *"bring more value to the customers and merchants, compared to existing solutions."*

To provide benefits over existing systems, the weaknesses of existing payment methods need to be discovered first (*"Design such systems that will overcome problems with current payment systems - so first discover exactly what the current problems are, and then research how mobile payments can help"*, or *"I think that the key barrier to any new payment scheme - whatever its manifestation - is to discover what consumer problem it solves."*)

At the same time, new mobile payment systems have to maintain and even improve the features of other procedures that people like: *"[An important question is] how we can replicate (and improve on) the 'good' features of money in the mobile payments environment."*

This issue seems not to be well understood by existing providers of mobile payment systems: *"Most new payment schemes start with the premise that they need to solve some problem which the banking or retail sector have, and they sort of forget that for most consumers most of the time cash and plastic works fine"*, or *"Most of new systems don't offer any advantages over existing forms of payment, especially credit cards and cash."*

All the adoption factors that are studied in relation to mobile payments need to be related to the same features in existing procedures (*"Produce a scheme which is easier/cheaper/safer/faster or whatever than the stuff we've had for hundreds of years!"*) Whether it is ease of use, cost, or convenience, this will be compared by the users to existing methods (*"Mobile payments are not convenient and easy enough compared to other payment methods."*)

As the findings above imply, other payment procedures, especially their strengths and weaknesses, need to be better understood when designing and implementing new m-payment systems. This highlights the importance of finding out in the current study what consumers appreciate in other payment methods, what their existing problems during payments are, and how mobile payments can provide more benefits than existing payment procedures. The following sections will provide, among others, such findings about other payment methods.

Mobile payments need to replicate all the good features of current payment methods, and overcome their weaknesses. M-payment providers need to understand the importance of relating their services to existing payment procedures, and offering more benefits comparing to such procedures; hence the category *Consumers' adoption factors* will always be *'in comparison to existing payments.*'

Ability to try

Many user participants were not sure about such systems since they never tried them. They were sceptical about mobile payments because they had no experience with them. However, they were willing to try: *"I haven't tried yet so I don't know if I like it or not. However, I would like to try."* They thought that after

they tried it, there was a chance they would rather like it: *"I would have to try it out and if I could use it for everything, then I would probably like it"*, or *"maybe if I saw how it works in real life, I would start using it."* Participants in one of the focus groups discussed the importance of being able to use the new system for an earlier specified trial period, for example one month, and being able to quit without any obligations if the user is not satisfied with the system.

Industry experts did not comment on this issue at all, which may suggest their lack of awareness of this factor. Trial periods, or other ways that would allow people to try such systems before committing to them could improve adoption and diffusion of mobile payments.

Security

Numerous end-user participants nominated lack of security as the key factor behind their unwillingness to try mobile payment systems. Many respondents were firmly against the idea of using such systems based on their assumption that such systems would not be secure. The opinions were strong, such as:

"No way. I think it wouldn't be safe to use this technology."
"This is a terrible idea. If you lose your keys or phone not only can you not get into your car/call someone but now someone can go on a shopping spree!"
"I don't think that paying with your mobile phone is such a great idea because if you lose your phone or someone steals it then they have access to your accounts as well."
"Security would be my biggest issue."

Numerous other respondents who indicated that they may be interested in trying such systems made it clear that they would only do so if security was assured,

such as in *"I would be interested, but it must be very, very secure"* or *"I think it is very smart technology but the security factor is what scares me."*

The analysis of security concerns revealed that they mainly revolve around the issues of lost or stolen phones, fear of hacking attacks, and the lack of reliability of the transaction. The issues are discussed below.

- LOST OR STOLEN PHONES

  Respondents were anxious about what would happen if their phone was lost or stolen, worrying *"what about security, if someone steals my mobile?"* They indicated that it is easier and more common to lose their mobile phone than their cards, for example: *"I've never lost a credit card but I certainly have left my cell phone at various locations,"* or *"I'm less guarded with my phone than a card I keep in my pocket."* In each of the focus group interviews, there was at least one person who has lost a mobile phone.

  While the ability of having all payment methods consolidated on a phone was seen as convenience, on the other hand it creates an even bigger problem when the phone is lost or misplaced: *"I generally don't like the idea of getting too dependent on one item. The mobile becomes everything and when you lose it or it gets stolen or you break it, your life is in a dead end."* The mobile payment service on the phone could actually increase the risk of theft even more, as a phone would become an even more attractive target for thieves: *"it makes the phone that much more valuable."*

  The respondents were concerned that it would become extremely easy for thieves, or anyone else who should not have access to the user's payments such as children, to make purchases from their accounts. It becomes therefore

apparent that providers should assume that a theft or misplacement of a mobile phone is a common occurrence, and hence there must be measures available to minimize adverse effects of such happenings, especially of someone else making unauthorised purchases.

Passwords or PINs are one level of protection: *"I would worry about losing my phone but I guess if it is password protected, it would be OK."* Other respondents were not convinced that a password would provide enough protection, however: "*And what happens if you leave your cell phone somewhere? Depending on how long your password has to be, it may not take long to figure it out."* Limiting protective measures to a password or a PIN therefore seems not enough for the users: *"Even though you must enter a confirmation number, it [one of providers' websites] also mentions it is more convenient because you do not need a signature or ID from the customer"*, which makes it insecure. The feeling then was that *"there has to be something to second check the identity of the customer."* Some respondents suggested fingerprint verification as another level of protection. One more method that would make the respondents less anxious would be a possibility of setting maximum limits of transactions.

- HACKING INTO THE SYSTEM

  Another issue that worried the respondents was that someone could use their accounts for payments without their even being aware of it. *"Someone may be able to use your account without your knowledge and it seems like a hackers dream."* The respondents were especially apprehensive about the systems where a phone may be waved in the proximity of the reader to access the funds. *"Since physical contact may not be required, this opens the door for those in your proximity to read your information."* The proximity connection

technologies make the consumers feel unsafe *"as criminals might be able to withdraw money by walking past me"*, or because of *"anyone who is nearby being able to read your information."* The participants were worried that anyone with the reader could take their money out. They were also anxious that there could be a numerous hacking techniques invented, *"especially with all of the new hacking devices out there."* Hackers could get access to the customer's password: "*I just wonder how easy it would be for someone to hack into your cell phone and get your password."* Another challenge remains *"maintaining data integrity."*

- RELIABILITY

  Some participants were especially sceptical about the reliability of proximity payments with waving the phone over a reader. They would not be certain if the transaction has gone through: *"I would have to worry about waving it in front of the laser too many times and buy one item multiple times."* Regarding all types of mobile payment systems, the participants were concerned that the phone may stop working during the transaction, for example running out of power. The respondents were also worried that without receipts they would not be sure about the payment since *"it's hard to check and verify your transactions."* The problem specific to mobile payments is that there is *"limited capacity of providing evidence like receipts and other physical things the people are used to."* Some user interviewees, when asked about the paper receipts issues, did not think it would be a problem in mobile payments if the confirmation of the transaction would always be displayed on the screen, and could be saved in the phone's memory.

In terms of the comparison to other payment methods, the respondents, when discussing the security of credit cards, liked the fact that if a card gets stolen, it

is easy to block any access to it by calling a special number. They also mentioned the set limit as another factor that makes them trust a credit card. The participants felt that identity theft with credit cards would not make them liable for unauthorised spending anyway, and they felt that *"you are protected, and you don't have to worry too much about it."* The participants felt comfortable with both credit and debit cards as they can view and verify their transactions online. The opinions whether cards are secure were divided, with some respondents expressing their concern with credit card security, but mainly in relation to payment over the Internet. Numerous respondents preferred the PIN method of debit cards to the signature only of a credit card. Credit cards with a photo of the owner on them were seen as one way of improving security.

The participants often mentioned the problem of cash not being able to be replaced when it is lost or stolen. They also felt that carrying large amounts of cash made them vulnerable to bag snatching, and was generally unsafe. Numerous respondents noted that it was very easy to lose cash.

Payments by Internet banking seemed to evoke many trust issues with the respondents. The Internet was not seen as a safe place for the participants, where *"security issues, such as identity theft, are the main concern"*, especially *"with all of the hacking scams increasing every year."*

To replicate the good features of other payment methods that would provide required security to consumers, mobile payment systems should therefore provide:

- an easy way of reporting theft/misplacement of the phone;
- the possibility of setting transaction limits;

- a clear statement on a lack of the consumer's liability for unauthorised transactions made by criminals;
- a way of accessing transactions history online to verify the purchases;
- passwords or PINs as a minimum level of protection of identity threat, but the consumers seem to want to have more levels of protection;
- when the phone is stolen or lost, a way for the funds on the account to be recovered;
- the security must be made explicit so that people carrying mobile phones with payment systems do not become a target for criminals;
- providers should also be aware that consumers do not trust security of wired networks, so it may be even harder to convince them that wireless networks are not susceptible to numerous hacking threats.

The industry participants saw security as a very important barrier to adoption and diffusion of mobile payments ("*Clearly security is high on the list*"). They indicated that there are still security issues that need to be resolved, also because of the insecure medium - "*physical resources of mobile devices have made the development of security mechanisms one of the most critical research problems in this area.*"

Trust/confidence

While discussing security issues, the industry participants realized the magnitude of the problem of *"customer psychology"*, or *"people's mindsets"*, since it is important *"to provide secure payment environment not only in technological way but also in psychological way"*, or *"people need to feel confident that the form is a secure way to make payments."* It is important to find out *"what forms of marketing will educate the customer in a way that might build confidence in the techniques and technologies."* Confidence has often been mentioned by the

respondents, for example, *"Probably the primary concern [...] is all about confidence - confidence in security of personal information, and confidence in the capabilities of the technology to deliver reliable and accurate results."*

Such confidence and trust may be improved by the use of trusted brands: *"Find out what people would trust and use and from what brands. E.g., would a bank endorsed payment system be favoured over a non-bank (independent 3rd party) operator such as PayPal?"* Branding was mentioned more often, for example: *"What influence will 'brand' play in customer take-up? For example, if Virgin m>Banking was introduced versus a Bendigo Mobile Banking... would this trigger more or less trust, and more or less propensity to try it?"*

The importance of the *"people's mindsets"* was also confirmed while analysing the responses of the user participants; this issue will be a major challenge for the providers who not only need to make the systems secure, but also convince the consumers that they are. The consumers will be hard to convince: *"While I'm sure the companies touting this technology will swear it is hacker-proof, I'm not willing to risk it."* There seems to be distrust towards providers, as *"their assurances are not enough."* This highlights the importance of clear and honest communication of the security of the new systems.

Moreover, numerous respondents praised debit cards for their security. They were not worried that the only protection method for a stolen card is a PIN. The PIN or password alone however did not seem to provide enough protection for users in mobile payment systems. This may indicate that the consumers may have even higher expectations towards new mobile payment systems, possibly assuming that there are more hacking devices available in wireless networks.

As implied by the findings above, providers must not only offer secure systems, but also convince consumers about it. This issue will be a major challenge for providers since consumers will be hard to convince. They may have even higher expectations towards new mobile payment systems than to their existing payment procedures, possibly assuming that there are more threats available in wireless networks. Consumers' confidence and trust may be improved by the use of trusted brands. Another important implication is the necessity of clear and honest communication of the security of the new systems.

Low cost

Another issue that clearly emerged during the data analysis in this study was the cost of mobile payments. Numerous respondents indicated that they would only be interested in such systems if there was no high cost involved. In fact, many would not use it if there was any additional cost at all: *"I would consider using it, as long as it didn't cost extra", "if no extra fees or interest is applied, then I would consider using this method",* or *"only if there is no extra pay."* This refers to both the cost of a new device and transaction fees.

- COST OF A NEW DEVICE

  The respondents indicated that they would not be interested in using a system which required a purchase of a new mobile phone, expressing, for example, that they *"don't want to have to buy another phone to use the service - I'd want a service upgrade or reprogramming."* Focus group participants also felt very strongly about the issue, with nearly everyone agreeing that they would not buy a new phone to be able to use the new system.

- TRANSACTION/STEADY FEES

  The participants also indicated that they only want a system with no or minimal transaction fees: *"I hope they wouldn't charge you some fee every time you pay!"* They were not able to provide a specific amount they would consider acceptable since it would depend on the product bought and additional value provided. The focus group respondents pointed out that especially with low value items and services, such as parking payments, transaction fees cannot be too high compared to the price of the ticket.

Industry experts thought that *"the cost of these transactions is also an inhibitive factor."* Cost effectiveness was seen as an important factor, as was the research on understanding *"who is going to pay for mobile payment, how much and what are they going to be paying for."* Nowadays, *"the fees are too high, and the service is just too expensive."*

Surprisingly, low cost was extremely rarely mentioned by the respondents when they talked about the other payment methods they liked. It was very often mentioned as a prohibitive factor, but when some systems do not cost much, or have no fees at all such as cash, it seemed it was quite obvious for the respondents, and the low cost was hardly ever given as the main reason for liking some payment procedure. When it comes to dislikes, it was one of the more often discussed reasons. It seems then that expectance of no or low cost is so strong that users would not use such systems otherwise: *"They charge you for spending your own money!"*

Some respondents thought that credit cards are expensive and these respondents hardly use the cards; numerous respondents from different countries also thought that interest rates are much too high.

As implied by the findings reported above, users would only accept very low or no cost associated with mobile payments. They do not want to purchase a new phone, and they expect minimal transaction fees, especially for low-value items. Low cost will not be seen just as an advantage over existing methods of payments - rather, it is the only way that they would use such systems at all.

Ease of use

To some respondents procedures of mobile payment systems seemed complicated: *"It needs much more work to increase user-friendliness"*, or *"sounds interesting but also complicated."* Some felt so strongly about it that it made them unwilling to try such systems: *"I don't think I would feel comfortable using a mobile phone only because I think it would be difficult to do"*, or *"I think it's too complicated, and people don't like complicated things like that."* They would have very high expectations towards the ease of use of such systems: "*As for voice calls, I would only use the service if it was automated and insanely simple along the lines of 'are you ___?', 'do you want to purchase ___ for ____?', or 'is this purchase of ____ correct?'*"

The respondents liked the ease of use of cards and Internet payments, with no one criticizing cards for lack of ease of use. Cash was praised for *"definitely ease of use"*, straightforward-ness, and simplicity. People then seem to find all the existing solutions easy to use.

The industry representatives also stressed the importance of making the systems easy to use ("*Can an average Joe/Josephine understand it?*"), *"making it simple"*, and *"with minimal learning curve."* Usability and user-friendliness were often mentioned. The current systems needs to be simplified since they are now often *"too complex - technology-oriented users needed to use them"* and *"they are*

sometimes just complicated." Such systems must be simple so *"people can UNDERSTAND and USE"* them. It is crucial to understand *"how to make a seamless user experience for mobile payment."*

Especially difficulty with typing on keypads was mentioned, and it was noted that *"it is very cumbersome to go through the login procedure as well as the actual mobile payment procedure."* Minimizing key presses or even one-click solutions would be desirable.

The industry participants also saw the importance of relating usability of mobile payments to existing payments: *"Make a payment simple - as simply to use as existing card based applications"* or *"how do you make mobile payment as easy as everyday debit card transactions?"* Nowadays, *"mobile payments are not easy enough compared to other payment methods."*

As these findings imply, users seem to have high expectations towards ease of use of mobile payments, especially because they find their current ways or payments very easy to use. This highlights the importance of making mobile payment systems extremely simple, especially that it will be something new for consumers. Learning time, therefore, must be minimal. Potential users now seem to think that current m-payment solutions are too complicated. The systems must be easy to understand and learn for an average user, not just for those who are technologically savvy. Limitations of phones' keypads must be considered a serious challenge, and efforts should be undertaken to minimize the number of clicks during mobile payment procedures.

Privacy

The respondents who were interested in using mobile payment systems did mention privacy concerns occasionally. Some felt that it is yet another technology that makes people lose privacy. *"There would be a complete lack of anonymity"* in mobile payments is an example of one strong opinion. Industry experts found it important to consider that *"the operator and retail store can track consumer's purchase history (just like credit card companies can today). Is this a good thing?"* Additionally, the spam issue is introduced: *"Just because you bought an item at a particular store does not mean you 'opted-in' to receive promotions about related items or stores."*

Cash was praised for its privacy and anonymity: *"Cash is great for purchases you don't want recorded"* or *"[I use] cash for my own things that I don't necessarily want my husband to know about."*

Several respondents criticized cards for lack of privacy and anonymity. Especially Internet transactions were of concern: "*Giving up too much info by internet banking is not something I like"* or worrying whether *"Is my personal info safe? Is my info being sold to third party vendors?"*

For all the other payment methods however, these were just solitary responses, and privacy was not often criticized. Providers need to take reasonable effort to demonstrate that the customers' information is private, but it seems that a general feeling is that technology has made people give up some privacy anyway, and mobile payments will not be worse than other electronic payments. This view was confirmed in the focus group interviews, too. One way suggested by the participants to increase privacy could be providing an option of not storing a record of a payment that a user does not want others to know about.

Ubiquity

The participants would like to use systems that they could use everywhere: *"If I could use it for everything, then I would probably like it."* The more places accept it, the better: *"Coverage - what can I buy with m-payment. If the service does not have coverage, it will be next to useless"* or *"it needs high adoption by merchants for me to start using it."* The users want mobile payments to be available everywhere, to pay various merchants, but also friends. Only if it is ubiquitous, they would see true value of it since they would not have to carry cash, cards, and a phone: "*I would have to try it out, and if I could use it for everything, then I would probably like it."*

The respondents do not want such systems to be limited to one mobile service provider. Similarly, they want to be able to pay it across borders, seeing a problem in *"limited coverage (standalone solutions - no collaborative cross border) efforts."* They expect international roaming based on the experience with mobile phones: *"When I travel abroad, I can use my phone in most places with no problems - if such payment systems worked there too, it would be great."* The systems currently are limited: *"I'm not that impressed as currently it has limited uses. However, when this method becomes more mainstream, I may be interested in using mobile payments."*

Some participants saw the value of mobile payment systems in only specific scenarios, or using specific methods ("*I am not interested in using my mobile device for paying in any other situation").* As an industry respondent puts it, *"an important question to answer is, I guess, to find a niche where mobile payment really makes sense."* Others also believed that an important issue is to *"find the appropriate consumer or business applications for its use", "successful business cases"*, and *"killer applications."*

In the current study, parking was often mentioned, as was paying for toll, petrol, and tickets. One scenario when mobile payments would be interesting is *"if you do not hold a credit card and want to buy items online."* Other people mentioned that they would use it if they did not have cash on them to pay for parking: *"If I was in a parking garage, I could just use the phone to pay if I wasn't carrying cash."* This suggests that it would be important to provide mobile payments in situations where other means of payments are not available, such as cash in online transactions, or credit card for parking and other small payments.

More respondents however seemed to expect ubiquity as a condition of using mobile payments - they would expect to use this system in a number of situations, the way they can pay now using cash or credit cards.

The participants commented that credit cards *"can be taken and used anywhere"*, and that they are *"accepted just about everywhere."* The coverage seemed enough for the participants, and even though they would say that it is *"**nearly** everywhere"*, or *"**most** people accept it"*, that seemed good enough for them. Debit cards were even more praised, with more definite responses: *"debit cards are accepted everywhere and I have no problem when I want to use them"*, or *"debit card is accepted everywhere."* Interoperability, even cross-border, was praised: *"When I visited Germany and Paris, I used my debit card the whole time"*, or *"When I travel, as many do, I don't think twice about using my credit card or ATM card... I just know they are going to work."*

Few people mentioned problems with ubiquity of cards, only referring to one type of card not being accepted (*"Sometimes some credit cards are not accepted and that creates a problem - e.g., getting tickets on the Internet to Soccer Cup was only available for MasterCard holders"*, or "*I have to carry 3 cards, in case*

Amex is not accepted sometimes"), or a specific situation (*"Debit - can't pay easily at restaurants"*).

Internet banking, as commented by the respondents, requires Internet connection, and is not available when one's connection is down.

Interestingly, even though cash is such a common method of payment, few respondents commented that *"it's very common"* and *"it works everywhere."* It seems that it is so common that it is taken for granted.

As implied by the findings above, a huge challenge for providers of new mobile payment systems becomes *"how to ensure any particular individual can make a mobile payment anywhere in the world?"* It is a massive challenge since existing payment methods are seen as extremely ubiquitous. Mobile payment systems providers must aim for the same level: *"You can use credit card anywhere in the world."*

Standardization

A mobile payment system not only needs to be ubiquitous, or in other words, widely available. Users also expect that the procedures will be standardized no matter where they are. They seem to have a high expectation of this feature based on their experience with other methods of payment, especially bank and credit cards: *"Standardized processes, as occurs today in credit card payments or in ATM withdrawals: it's always the same steps no matter where you are,"* or *"a standard that make the handsets work like credit card."* Potential users require that mobile payments work *"in a consistent way with all phones."*

This could be a challenge according to our industry participants, mainly because of *"heterogeneity of devices"*, and *"so many phone models"*. Therefore, *"industry standards need to be introduced"*, and what is necessary is a *"cross-industry consensus for standardisation"*, and *"the adoption of a uniform mechanism for the interface"*, which can finally result in *"a seamless ecosystem."*

Convenience

Convenience of payments has appeared as one of the most important adoption factors. It seems also that potential users already see mobile payments as convenient. The respondents who were very positive about the possibility of paying with their mobiles were mainly commenting on convenience of such payments: *"That would be neat, I would like to use the phone for convenience"*, *"the convenience would be amazing"*, or *"I could see its worth and convenience."*

The main way how mobile payments are convenient is that users do not have to carry many coins, cards, or devices on them: *"that would let me carry fewer things around town, and all I would have to remember when walking out the door is the phone and my keys. No purse and I can still buy or do anything I want."* The all-in-one concept appeals to potential users: *"I would love an all in one device"*, *"it would be nicer than having to carry a purse/wallet that holds everything"*, or *"it would be great to use my mobile for everything."* Especially, certain type of users would be likely to appreciate it: *"I'm sure a market exists for the people that own Crackberries [Blackberries] because those types enjoy the streamlined simplicity and consolidation."*

Convenience was often the main reason for customers preferring one payment system to another. Consumers seem to think that cards are very convenient, so it may be harder to convince them that mobile payments are even more so:

"Convenience is the main reason for a credit card", or *"Credit cards are soooo convenient."* Similar opinions concerned debit cards: *"Debit card is definitely a convenience"*, or "*credit and debit are extremely convenient."* The main convenience factor was that there is no need to carry cash around. When the swipe machines are located outside the store, such as on petrol stations, this provides additional convenience ("*Debit and credit are very convenient when I want to buy gas but don't want to go inside the store*"). It was extremely rare that the respondents would see cards as inconvenient. The only issue mentioned concerned the signing process when a person has a very long name, for example, and a matter of needing both hands free to sign was also mentioned.

The convenience of paying bills on the Internet was also very often praised. Paying from home, and without even leaving home or waiting in queues were often cited as very convenient: "*I don't need to go to the post office or bank and wait in queue to pay for that"*, or *"Internet banking makes life so much easier, don't need to go anywhere to pay your bills."* Additionally, independence of banks' opening hours was mentioned, and the fact that bills can be paid online at any time: *"internet banking – it's 7*24*365."*

While some respondents liked the convenience of cash, many felt strongly against it, with some using the word 'hate' to describe their attitude: *"I hate digging out cash and having change rattle around"* or *"I hate making other people wait while I put the money back in my wallet."* Numerous respondents referred to paying cash as *"a hassle" or "a pain"*, for example: *"coins/change is a pain, especially for a wallet size."* Many people mentioned that they do not like carrying much cash in their wallets. Common opinions included: *"I dislike all the coins taking up space in my wallet"*, or *"I hate cash most, it is so heavy, especially 50 cents in Australia. My wallet is so heavy because of the coins."* These

examples and many similar responses indicate that the size and weight are seen as an extreme inconvenience of cash, as is the necessity of looking for small change.

Mobile payment systems may offer an attractive alternative to cash since users do not seem to mind carrying their phones around, they have it on them anyway, and having payment systems in their phones would not require any extra space and weight. It would also be more convenient and free them of worries such as looking for change, or having enough change. Such systems were seen as *"less of a hassle."* Credit and debit cards, however, already offer these advantages, but mobile payments that require no signing could still compete on the convenience factor. Other convenience factors that matter to users include no need to go to a specific place to pay, no waiting in queues, and anytime access.

Industry respondents did not comment on the convenience as often as on other factors, such as ease of use. Only a few mentioned the factor, saying, for example, that "*the convenience factor will drive uptake.*" It seems that industry stakeholders need to better appreciate the importance of convenience factor in successful implementations of mobile payment systems.

As implied by the above findings, potential users already see mobile payments as convenient. This is mainly because users would not have to carry many coins, cards, or devices on them. Cash was seen as an especially inconvenient payment method. Mobile payment systems may offer an attractive alternative to cash since users do not seem to mind carrying their phones around, they have it on them anyway, and having payment systems in their phones would not require any extra space and weight. It would also be more convenient and free them of worries such as looking for change or having enough change. Credit and debit

cards however already offer these advantages, but mobile payments that require no signing could still compete on the convenience factor. Other convenience issues that matter to users include no need to go to a specific place to pay, no waiting in queues, and anytime access. The findings also indicate that industry stakeholders do not appreciate enough the importance of the convenience factor in successful implementations of mobile payment systems.

Speed

Another factor that mattered to end users was the speed of transaction: *"I would like to pay through my mobile if it provides speedy function"* or *"only if it's VERY quick."* The respondents who liked the idea of mobile payments pointed out that it would be fast, saying for example that *"it would fix what bothers me about credit transactions: speed."* The time could be saved by eliminating the need to sign or enter PINs (*"It will save us time if we don't have to put the pin number or sign"),* as well as to count money (*"I don't like counting out cash",* or *"you don't have to count your money").* No respondents thought that such systems could be too slow.

The respondents' opinions were divided about the speed of credit card payments, with some liking it and some complaining about it; the latter often felt that singing takes too long. Debit cards were considered faster. Most respondents liked the speed of cash transactions, and similarly, the speed of paying bills online.

The industry participants mentioned issues with connection time, and saw the current time needed for mobile transactions as a problem. Comparison to other payment systems was stressed again: "*Design systems that will require less time than other forms of payments."*

Mobile payment systems are seen as fast by potential users, which was confirmed by the focus group interviewees. This could be important for providers since consumers do have complaints about the speed of their current payment methods, and therefore, they should be made very aware of the speed advantage of mobile transactions.

Ability to keep track of purchases

Some respondents liked the fact that mobile payment systems would allow them to keep purchases history, but it was not often mentioned. Few respondents thought about whether using mobile payment systems would make it easier or harder for them to track their spending.

Numerous respondents appreciated the factor in both credit and debit card payments however: *"Keeping track of everything I purchase is definitely also a plus"*, or *"I can track my purchases, compare my budget with my statements and see where every dime I spend is going."* Viewing all the transactions on the Internet, whenever needed, was definitely seen as an advantage: *"It's also great to see all your purchases on the internet, even several times a day."* What it means to the participants is that *"you can monitor your monthly spends"*, and keep track of one's purchases. Additionally, it is important when the expenses are reimbursed by companies, such as *"it is the easiest to pay by card to keep a straight line for accounting."* Internet payments were similarly seen as easy to track: *"I always keep track of my purchases online on Quicken. I would rather pay online so I can get a confirmation number that my payment went through, so I can copy & paste to my Quicken register."*

The problem mentioned with debit cards concerned the fact that purchases and balances can only be viewed after finding an ATM or online, which creates the

following problems: *"One can overdraw if one is not aware of one's balance"*, or "*I'm always scared that I don't have enough on my debit card to pay since I don't remember my balance - it would be very embarrassing if there was not enough."*

A few respondents, although not many, also thought that cash lets them keep track of their spending, by seeing what is left: *"Cash helps me to keep track of what I have left"*, or *"I like to see how much I'm spending so I can keep to budget."* More opinions, however, were the opposite. The respondents thought that it is hard to keep track of what the money is spent on, and they do not know where it has gone (*"You just don't know what you spent it on"*, or *" I don't like using cash because it is harder to keep track of"*).

Industry participants did not comment on the issue at all. It may suggest that current providers do not appreciate the importance of this feature for the users. It seems however essential, based on the findings above, that mobile payment systems give the consumers an opportunity to view their purchases for a specified period of time since users appreciate this feature a lot in card payments. This would allow them to not only verify their purchases, but also keep track of their spending by knowing what they have bought and how much they have left. Mobile payments could provide an important advantage over existing payment methods since the purchases and balances could be looked up anytime, anywhere, thanks to mobile connection technologies. It would also be important to provide full statements online.

Ability to control spending

The respondents did not comment often about whether they think that mobile payments would enable them to control their spending. The only exception was when they thought about one specific method of such payments – adding them to a phone bill: *"The problem with mobile payments could be with the ones added to a phone bill. I need to know exactly how much there will be on my statement every month (I'm on a fixed plan) and any deviation (by paying with mobile there would definitely be some) frustrates me a lot"*, or *"I would be concerned about differentiating between costs for the mobile and the extra costs charged to it for the new activities on my bill."*

This factor emerged as important, however, when the respondents talked about their existing methods of payment. Debit cards let them keep their *"spending under control"*, and they were "*more frugal with debit card than cash."* The main way debit cards let consumers control their spending, as discussed by one focus group participants, is the ability to check their account balances online or through an ATM.

Credit cards were criticized in this respect, as it is *"possible to lose oversight, and spending is too easy."* Numerous other participants commented on that factor, for example: *"Having a credit card makes my shopping uncontrolled – I don't think how much money I spend"*, *"it's very easy to overspend"*, or *"too easy to just pay later."* Credit cards *"allow one to live way above one's means"* and when it comes to payments at the end of the period, *"you can come up short"* since *"you spend what you don't have."* The respondents often discussed the danger of it: *"With credit card I cannot feel how much I spend, so I can spend more."*

Numerous people had a similar opinion about cash: *"I hate paying with cash – it makes me feel like I am losing money"*, or *"with cash I have no control over my money."* Hardly any respondents thought the opposite about cash. Cash just *"spends too easily"*, it is *"easier to waste"*, and it just spends faster, according to numerous participants. The opinions were quite firm: *"I hate cash most, it always just disappears."*

Industry experts did not comment on the issue at all. The findings above do indicate, however, that it seems important that the users feel that a new payment method gives them control over their spending since otherwise, they will not like it. Having a clear and immediate access to their available balance statement, but also planning or daily limit options could make a mobile payment system an attractive payment alternative to the consumers.

Flexibility

Participants did not seem to comment on flexibility of payments when discussing possible mobile payment use, but it was a significant factor in other payment methods. This stresses the importance of researching the users' attitudes to existing payment procedures since such influential factors could otherwise go unnoticed.

Card payments allow the respondents "*more flexibility*" since there is no "*need to think ahead about how much money I might need.*" There is no need to plan ahead, and know how much they will spend. This was an often mentioned problem with cash, and the necessity to find an ATM to withdraw money when not available ("*A cash payment needs planning ahead and the availability of cash machines*", or *"I have to worry about having the correct amount of cash on me, and have to keep going back to an ATM*").

This seems to suggest an important implication to mobile payment systems providers. Users want to have flexibility in their purchases, and be able to pay whenever the need arises, without earlier planning. A mobile payment system should provide a way for consumers to charge their accounts whenever they want, without the need to look for a machine to charge it. Mobile phones' connection possibilities could be used for such charging procedures.

Additional Rewards

Rewards systems were also not mentioned in mobile payment scenario but were often mentioned as one of the factors that made the respondents like some other payment procedures. "*I use credit card all the time because I collect frequent flyer points and then I go on holidays for them.*" Some respondents chose to use a specific payment method, usually a credit card, just because of the loyalty program ("*I recently acquired an American Express and will start using it instead of my debit card to receive extra rewards*" or "*My credit card has a point program where I can earn a cruise; therefore, I like it for that feature*"). It seems to be an important adoption factor for many users ("*Only 2 issues matter to me: convenience and loyalty program - free travel just for using my credit card*").

Industry respondents also saw the importance of providing some additional value through incentives (*"Find ways to incorporate additional value, incentives in such mobile payments"*).

As the findings indicate, additional rewards could be the decisive factor for some users making them choose a specific payment method. New mobile payment systems could offer similar rewards programs to card programs to attract consumers who might otherwise use other payment methods. Focus group users suggested that mobile payment providers could target younger people by

offering easier to achieve rewards such as movie tickets or shopping vouchers, instead of airline tickets.

High number of users

Another issue that needs to be understood is the "'critical mass of users" challenge. As explained by our industry respondents, *"until there is critical mass of users and merchants and network capability and then trust, it will not take off. But once it takes off, it will grow rapidly."* The issue is even more complicated since both consumers and merchants networks are important (*"The research issue is to find huge number of buyers and sellers"*, and *"You need to persuade a huge number of buyers and a huge number of sellers to all adopt the same mechanism."*). Payment platform needs to be supported by enough merchants and consumers *"to enable 'critical mass' of users in order that the payment system is viable."* The PayPal example was mentioned to support this view since the more people were joining PayPal, the more valuable the system was becoming to the existing users.

As the findings indicate, providers need to understand that critical mass of users will make the mobile payment system viable. The relationship between consumers' demand and merchants' demand needs to be understood too, since *"it's the chicken and egg problem: how to manage the network externalities or lack of them in mobile payment diffusion process."*

Education about the benefits

Another issue that has emerged in this study is that it is not enough that providers, in their new mobile payment systems, offer the features that users desire, as described above. Another important matter is making sure that users know and understand such benefits, and this includes both consumers and

merchants (*"to promote and to educate the users and the merchants"*). The users need to be convinced about the benefits of mobile payments, since *"the barrier is people's mindsets."*

The industry respondents also commented on the general awareness issue. They thought that there was *"lack of interest due to lack of information"*, and that *"customer awareness needs to be increased."* A way to encourage users could be *"evidences for successful mobile payments without any bad news (more successful stories)."*

Numerous participants in the current study were interested in m-payments, but did not understand or know how they work (*"I don't know how"* or *"no idea how it would work"*). It seems important to educate the users on the systems, to make them realize their worth: *"I would just need some extra explanation on how to use the service"*, or *"I'd like to have more information on it."* Users would initially judge new systems based on the information presented to them so it seems crucial to communicate the system's worth properly: *"I am not familiar with the methodology in detail which makes it difficult to judge."*

Increasing both consumers' and merchants' awareness by providing clear information about mobile payments, including success stories, how mobile payments function, or what specific benefits they provide, has emerged as an important factor in improving adoption and diffusion of mobile payments.

The following figure presents the categories and properties that are included in the *Consumers'* perspective, which is one of the building blocks of the emerging theory (Figure 20 on the following page).

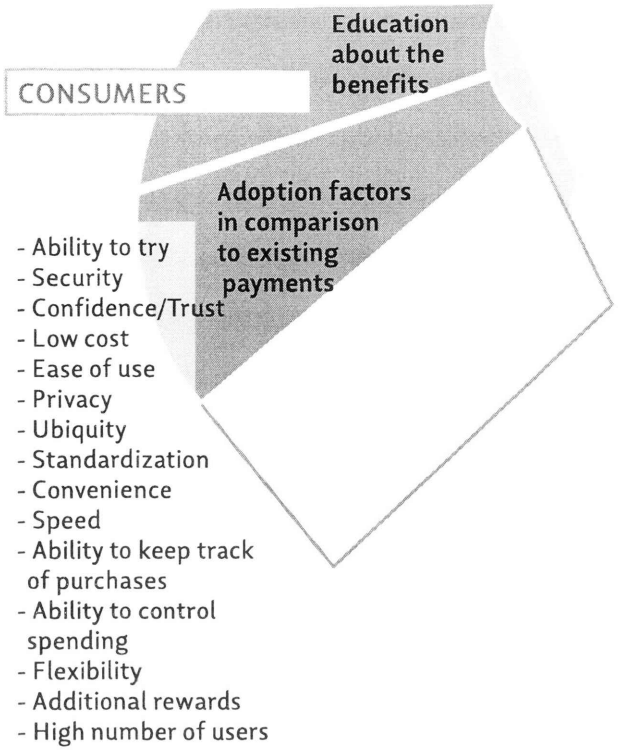


Figure 20: The Consumers' perspective in the emerging theory

6.5 Merchants

Some important issues have emerged in the merchants' perspective as well. Merchants are also users of mobile payment systems, as they need to adopt the new mobile payment system to provide it to their customers. A necessary condition in this perspective includes mobile payment companies' fulfilment of *Merchants' adoption factors*, which means the necessary features that will make merchants more likely to accept and use the new procedure. This category has as its properties such specific features that merchants require to adopt mobile payment systems. Another condition is the one described above in the *Consumers'* perspective, *Education about the benefits*, since this factor concerns merchants as well.

Merchants' adoption factors

Merchant adoption was mentioned as an important issue in the overall success of mobile payments. Some respondents saw, as the reason for the slow growth of mobile payments, "*low acceptability and use of the current mobile payment solutions among merchants*", or just *"slow adoption by merchants."*

Identified adoption factors of merchants, or, in other words, features required by merchants to use a mobile payment system, include *Cost*, *Value*, *Security*, and, as presented in the *Consumers'* perspective, *High number of users*.

Cost

High fees for merchants were mentioned as the main deterrent of adoption of new m-payment systems by merchants. The cost of entry for merchants is often prohibitive, and *"it is difficult to provide a low cost solution that will suit the largest number of merchants."* The importance of this issue cannot be underestimated: "*Areas of interest would be to understand who is going to pay for mobile payment, how much and what are they going to be paying for. Is it the merchant to assist with distribution or collections?*"). Especially in terms of micropayments, *"a system must have very low merchant transaction fees."*

Merchants expressed their interest in such systems if they would not have to bear additional costs. As one interviewee commented, they bear fees for credit card transactions because of high consumer demand but the new system could not require any higher fees that those of existing payment instruments.

Value

A system must also offer some value to a merchant *("an m-payment solution must be found which would bring more value to the merchants"*). As one

interviewee put it, *"if it's cheaper or faster or more secure or whatever than other methods, then why not? But only if it doesn't cost me much and doesn't take long."*

Security

The merchant must also feel that the system is secure for them. The issue is, *"Is the merchant protected from fraud, illicit chargebacks, and others?"* The merchant participants were worried that mobile payment systems could result in fraudulent transactions.

This section revealed that to make merchants adopt mobile payments for the use of their customers, providers need to offer systems with low transaction fees, some additional value, and one that would alleviate merchants concerns about security.

Education about the benefits

As revealed in the *Consumers'* perspective, it is not enough to provide the features required by the users, but companies also need to make the users aware of such benefits that their systems offer. Merchants in this study seemed not to understand how such systems could help them but, when offered explanations that pointed out the benefits that such systems could offer to them, they could see the worth of mobile payments.

The categories and properties that are included in the *Merchants'* perspective are presented in the following Figure 21.

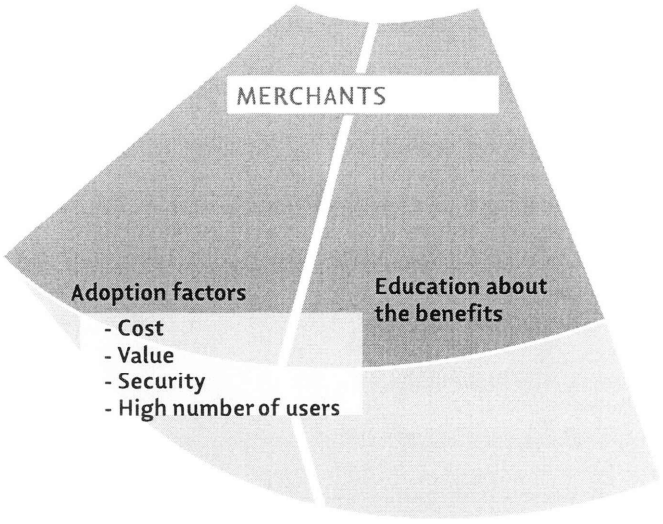


Figure 21: The Merchants' perspective in the emerging theory

6.6 Technology

Technology is another perspective that includes some contexts and conditions that providers need to understand and take into account in their new mobile payment offerings. *Technology* perspective includes a consideration of available features of mobile devices, understanding of other available technologies, and solving specific technical problems that may hinder adoption and diffusion of mobile payment implementations.

Available features of devices

The maturity and level of advancement of mobile devices is another factor that needs to be understood by providers of mobile payment systems. Some respondents put forward that slow uptake of smart phones slows down the growth of mobile payments. The devices are not advanced enough yet ("*The new generation of smartphones is beginning to make this [mobile payment success] a*

*reality, but these devices are not yet mature enough to an extent that makes it possible to support *all* devices with an existing system."*)

Mobile phones have a number of features that make them ideal for mobile payments, according to some respondents. People carry them everywhere and are very familiar with using them. Mobile devices have a number of limitations too that may influence the development of mobile payments. Their keypads are difficult to use, and, according to our participants, screen sizes are not large enough. This does not mean that the devices cannot be used for mobile payments, but these features need to be understood, and accommodated in new systems, for example by *"minimizing key presses"*, or *"one-click solutions."*

Additionally, the characteristics of phones affect security of m-payment systems: *"physical resources of mobile devices have made the development of security mechanisms one of the most critical research problems in this area."*

As this section revealed, providers need to understand and take into account the currently available features of mobile devices, to make the best use of them in new mobile payment systems. When more advanced smartphones become more widespread, providers need to consider how to best use the new features such phones will offer.

Available technologies

Not only devices, but the advancement of various technologies will have an effect on the development of mobile payments. *"Application and special development of new technology"* is important for mobile payments. Some participants thought that mobile payments are not successful in countries where available technology is not advanced enough, for example in Australia, as compared to Japan or

Korea. One of such comments follows: *"All the technology is there already, this is a huge business in Japan and Korea [....] [Mobile payments] are already 'truly' successful, just not in Australia or many other countries. Simply because we are behind in technology."*

Some participants on the other hand thought that mobile payments should be based on those technologies that have already been widely accepted: *"Use existing adopted technologies, e.g., SMS - they are necessary to drive the adoption of mobile payment."*

Technologies that the respondents discussed in terms of their influence on the mobile payment adoption and diffusion include, for example, various connection technologies, smartcards reader infrastructure, or available security protocols.

Providers need to have an excellent understanding of available technologies, and use them properly in mobile payment implementations. What matters is *"having insightful organisations who can implement the technology properly."*

Solving specific technical problems

There were many specific technical problems mentioned that need to be solved before successful implementations can be introduced. They include *"device performance (afflicting crypto schemas adopted)"*, *"connectivity software portability (J2ME is still immature)"*, *"threats to W-PAN service availability"*, *"ability to recall a transaction"*, *"adoption of large and easy to deploy PKI"*, *"open-loop and multi-hopping m-payment schemes"* and others. A payment gateway issue was often discussed by the industry participants, especially *"how to setup standard payment gateways to make it easy for the financial institutions to implement mobile payment"*, *"the absence of matured payment gateways"*, and

"ease of integrating with gateways." How to handle registration, customer identification, and billing were other common themes.

To sum up, there are a number of specific technical problems that need to be solved by the providers, such as setting up standard payment gateways, or handling registration of users.

The following figure summarises the *Technology* perspective, one of the building blocks of the emerging theory (Figure 22).

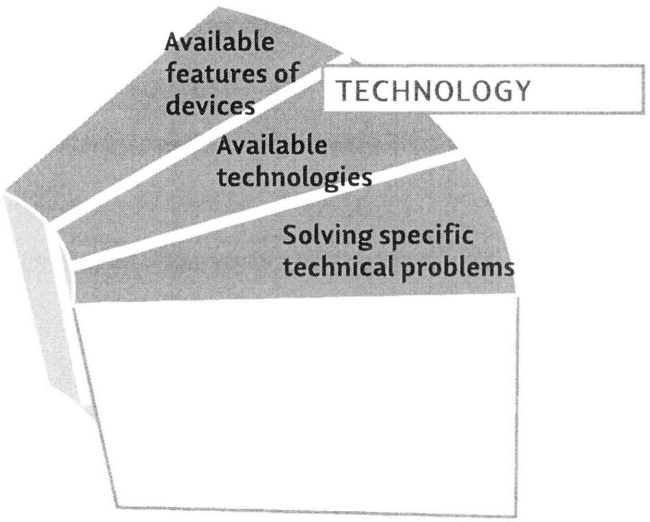


Figure 22: The Technology perspective in the emerging theory

6.7 Society

Another perspective includes those issues that providers need to understand about the society in which they are introducing their mobile payment systems. The *Society* perspective differs from the *Consumers'* perspective since the latter has revealed a set of conditions that a universal mobile payment solution needs

to fulfil for the users to adopt it. The former is specific to the specific society where the mobile payment system will be implemented. Providers then need to accommodate the *Consumers*' conditions, and additionally consider the specific *Society* perspective in the specific market in which they operate to possibly include some additional features in their systems.

Cultural influences

The respondents in this study mentioned the cultural or social aspects of the mobile payment environment. Some responses included comments about *"social aspects that need to be understood"*, the importance of *"comparison of different national markets"*, *or "the role of culture in the success or failure of new mpayments."* Some suggested to *"find out how it is possible that some systems in some places do get lots of users, and others not."* Some cultural influences suggested in the survey answers included various payment cultures of countries, where, for example, some nations may prefer to use Internet more than others, so the Web registration for the first-time mobile payment users may be the suitable option in this country. Another example discussed includes some cultures' strong inclination to use SMS extensively, which could suggest this specific payment processing option.

To sum up, providers need to consider and accommodate various cultural influences in the society where they want to introduce their mobile payment systems.

Number of mobile phone users

The popularity of mobile phones is an important factor that can help adoption and diffusion of m-payment systems, since, as some users said: *"My cell phone is my best friend so why not [use it for payments]"* or *"everything linked to my*

cell would be awesome." On the other hand, some respondents firmly stated that they would not be interested in such systems simply because they do not carry or own a mobile phone (*"I do not have a mobile"*, or "*I use my cell phone as little as possible"*).

Industry stakeholders also commented that *"the important part is not the mobility, but the ubiquity of the cell phones."* Opportunities exist because *"cell phones have much, much more penetration and coverage than does Internet connectivity. In fact, one doesn't realize that almost everyone has Internet access in one way or another, if they have cell phones."* Mobile phones are popular since *"the payment scheme for cell use is 'Calling party pays'; any call I receive is paid for by the calling party, so I'm happy to leave my phone on all the time. Prepaid phone cards are readily available so many people have cell phones to receive calls. These phones could well be used for utility payments for example."*

Adoption and diffusion of mobile payment systems in a given country will clearly depend on the number of users of mobile phones and their attitudes towards using their phones.

The categories that are included in the *Society* perspective are summarized in Figure 23 on the following page.

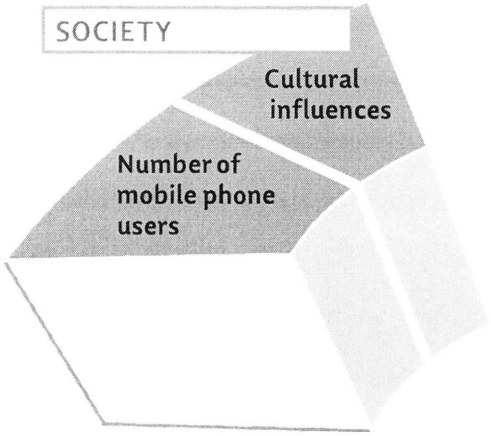


Figure 23: The Society perspective in the emerging theory

6.8 Authorities

The *Authorities* perspectives deals with various laws and regulations with which providers need to comply regarding their mobile payment offerings.

Legal issues

As pointed out by mainly industry respondents, there are legal challenges surrounding mobile payments. *"The same way many new issues appeared with e-commerce, and new laws had to be created or expanded or interpreted."* Regulatory questions must be addressed, *"and the optimized behaviour to these."* There seems to be, however, an issue of an *"absence of government/regulatory authority support."*

Respondents often mentioned market regulation issues, pointing to such matters as a *"regulated market situation by different EU directives like ELMI (Electronic*

Money Institute)." Another problem is that of *"liability within the system (customer, vendor, transaction processor, billing issuer)."*

To sum up, providers need to gain an excellent understanding of laws and regulations that may affect their mobile payment services.

Taxation issues

Tax issue was also mentioned by the respondents. Taxation regulations regarding mobile payments need to be understood since, for example, *"in some countries all mobile transactions attract some percentage tax for service providers."* It is an important issue since *"e-commerce showed how all different tax regulations had to be reinterpreted in this new context, now the same must be done for m-commerce."*

Taxation regulations therefore need to be carefully considered by mobile payments providers in light of new issues that may be brought about by mobile transactions.

This perspective, as one of the building blocks of the emerging theory, is summarized in Figure 24 on the following page.

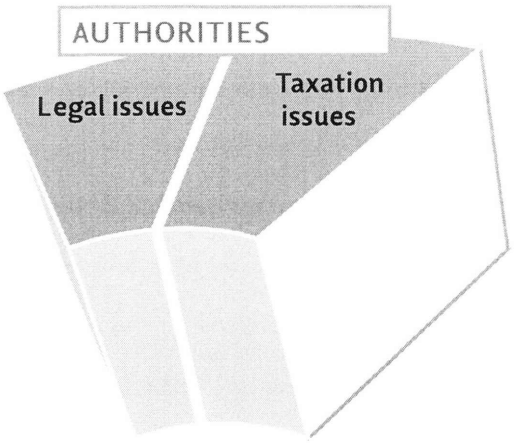


Figure 24: The Authorities perspective in the emerging theory

6.9 Chapter Review

This chapter presented the outcome of the data analysis of the study: the emerging theory that formulated categories and properties into a logical and explanatory framework. This theoretical framework represents the mobile payment success factors identified in the research. It was presented both in a diagram, and explained in detail in a narrative structured around the identified categories.

The success factors in the theory are organized around six perspectives: *Providers, Consumers, Merchants, Society, Technology*, and *Authorities*. *Providers' Understanding of Contexts and Fulfilling Conditions* has emerged as the core category that can influence the main problem of improving mobile payment systems' adoption and diffusion. All other categories are related to the core category, as they represent contexts and conditions that must be

understood and accounted for by mobile payment providers in order to improve adoption and diffusion of their initiatives.

Providers' contexts and conditions that need to be understood or fulfilled, respectively, include *Devising suitable revenue models*, *Cooperation between the involved parties*, and *Understanding the various players' strengths or capabilities* that they can bring into mobile payment partnerships. The last category includes additional properties: *Operators' existing customer bases*, *Infrastructure, Existing relationships*, and *Openness to new technologies*; *Banks' existing customer bases, Existing relationships, Core payments technology*, and *Trust*; as well as *Independent companies' fast responsiveness*, *Flexibility*, and *Skills*.

Consumers' conditions include *Adoption factors*, always *in comparison to other existing payments*, and *Education on such benefits*. The *Consumers' adoption factors* category has numerous properties, including *Ability to try, Security, Trust/Confidence, Low cost, Ease of use, Privacy, Ubiquity, Standardization, Convenience, Speed, Ability to keep track of purchases, Ability to control spending, Flexibility, Additional rewards,* and *High number of users*.

Merchants' adoption factors category includes properties of *Cost, Value, Security*, and *High number of users*; another condition in this perspective includes *Education on the benefits*. Categories in the *Technology* perspective include understanding of the available features of devices and other available technologies, as well as the necessity to solve specific problems that still hinder the development of mobile payments. *Society's cultural influences* and *Number of mobile phone users* are influences that providers need to understand as well. *Authorities'* perspective includes *Legal issues* and regulations that providers need to understand and comply with, as well as *Taxation issues*.

The role and position of the literature review in grounded theory research are very specific and differ from many other methodologies where literature is studied before the research commences. Literature review in grounded theory research should never be conducted before the study since it imposes and limits the views of the researcher – the researcher is tempted to think in the "proper" way, using prescribed models and categories proposed by other researchers. The framework proposed above was built using the data coming from the participants, without using common and imposed words from known models. The following chapter explains this concept further. After the initial theory had emerged, the literature review was then used to further shape and refine the theory, just as the primary data was used earlier; this process is described in detail in the next chapter.

7. Literature Review: Refining the Theory

The previous chapter presented an emerging theory that was built from the data coming from the participants, without being influenced by existing literature. This chapter first explains the unique role and place of a literature review in grounded theory. It then provides a comprehensive review of existing theories and findings that may refine the emerging theory. The review starts with various theories on adoption and diffusion of technological innovations in general, and then explores success factors proposed for mobile payments and related fields specifically. In each case, the literature review factors are constantly compared to the proposed theory. The discovered similarities and differences will be discussed further in the following chapter.

7.1 The Role of a Literature Review in Grounded Theory

As mentioned in the review of the previous chapter, the role and position of a literature review in grounded theory are very different than in many other methodologies. Traditionally, literature is studied in detail before the research starts. Glaser (1998) emphasizes that grounded theory's very strong dicta are: a) not to conduct literature review in the substantive or related fields before beginning the study, and b) to use literature search only when the emergent theory is almost completed, and the literature review can be woven into it as more data for constant comparison.

Such an approach makes it possible for the researcher to stay as free and open as possible to discovery and emergence of concepts (Glaser, 1998) The researcher will not be influenced by other authors, grabbed by received concepts, preconceived imposed problems, rhetorical jargon, and speculations that may be found in the literature (Glaser, 1998). Literature review before the research can *"contaminate, constrain, inhibit, stifle, or otherwise impede the researcher's effort to discover emergent concepts and hypotheses*" (Glaser, 1998, p. 68). Grounded theory must be free from the claims of related literature.

The author of this thesis put much effort into following these dicta. As the Introduction chapter revealed, the initial literature search aimed only at providing an overview of topics studied in mobile payments to shape research questions and to make sure that this study provides an original contribution to the field. Specific findings were not analyzed, however. During the data analysis, the researcher tried to stay free from any claims she knew from literature. Naturally, during the three years of this study, a lot of knowledge about the topic has been

accumulated while attending conferences, meeting researchers working in the field, or reading news stories about mobile payment solutions. As Glaser points out (1998), it is often impossible not to read anything about the field of study – what is important, however, is to be able to put aside any received concepts, claims and speculations while analyzing data, and remaining true to the data as much as possible. The researcher often found herself trying to fit what the participants said with what she had heard earlier, only to remind herself that the theory must come from the data, not be imposed on the data. When coding, the researcher distanced herself as much as possible from the speculations offered by others.

Literature should be reviewed only when the theory is already well formulated, which is the procedure adopted in this study. Literature becomes data to constantly compare, and the theory at this stage is strong enough to accommodate the comparisons (Glaser, 1998).

Existing articles are used in grounded theory similarly to primary data gathered from interviews. Secondary materials are as potentially valuable for generating theory as interviews or observations (Glaser & Strauss, 1967). Every article, according to the co-originators of the grounded theory methodology (Glaser & Strauss, 1967), represents at least one person who is equivalent to the informant or interviewee. The emerged categories and their properties point the way to relevant comparative materials (Glaser & Strauss, 1967).

According to these recommendations, literature will be reviewed in this chapter after the theory has already been proposed, with the purpose of further shaping and refining it by the constant comparison method. The constructs proposed in the literature will be compared to the categories and properties of the emerging

theory, in a process similar to the earlier one where the data coming from the participants was also being constantly compared to the emerging codes. It will be revealed which literature constructs confirm the proposed categories and properties; those literature constructs that have no match in the emerging theory will be further investigated in the following chapter where the data will be analysed again specifically with those constructs in mind. Such factors will only be incorporated into the final theory if they indeed prove to be grounded in the data gathered.

Such modifications do not weaken the theory, since every grounded theory is easily modifiable, allowing for change (Glaser, 1998). Grounded theory gives transcending and border view to existing findings, integrating and putting articles into a fuller perspective. The data-literature becomes integrated into the theory (Glaser, 1998).

7.2 Theories Explaining Technology Adoption and Diffusion

Over the years, numerous technology adoption and diffusion models have been proposed and validated in various studies. Such models aim to explain which factors affect the adoption or diffusion of technological innovations. The models claim to be generic and apply to various information systems, and therefore, they are reviewed here to possibly shed more light on the mobile payment adoption and diffusion success factors. Subsequently, another section will examine the adoption research in the mobile payment field specifically.

Various academic databases were used to find technology and diffusion models, and they included ProQuest 5000, IEEE Explore, ACM Digital Library, and Ebsco,

as well as the Supersearch tool to search multiple databases. The Google search engine was also used to further explore the topic. Especially useful were publications that discussed a variety of existing models, such as Venkatesh et al. (2003) or Mallat (2004). One useful strategy was searching for adoption and diffusion papers in any field of Information Systems, learning what models numerous authors used in their studies, and then investigating these models from original sources. As pointed out by Venkatesh et al. (2003), technology adoption research is divided into several streams, including those that focus on individual acceptance of technology by using intention or usage as a dependant variable, those that focus on implementation success, and those that focus on task-technology fit, among others. This section aims to provide a comprehensive review of such various perspectives, which is aligned with the aim of this study to discover as many influential mobile payment factors as possible.

Diffusion of Innovations (DoI)

Rogers (1962, 1995), to explain adoption of various types of innovations, formulated a set of theories that take into account three perspectives, including innovation characteristics, adopter characteristics and the adoption process. These Diffusion of Innovations theories are now among the most widely-used theories of adoption (Surry, 1997).

The innovation characteristics perspective is included in Roger's (1962, 1995) Theory of Perceived Attributes, which puts forward that potential adopters judge an innovation based on their perceptions in regard to five attributes of the innovation:

- Relative advantage: "the degree to which an innovation is perceived as better than the idea it supersedes"; measured in terms of economic

benefits, social prestige, status, convenience, or satisfaction, and relative to other innovations or the status quo;

- Complexity: "the degree to which an innovation is perceived as difficult to understand and use";
- Compatibility: "the degree to which an innovation is perceived as being consistent with the existing values, norms of a social system, past experiences, existing practices, and needs of potential adopters" ;
- Trialability: "the degree to which the innovation may be experimented with on a limited basis"; possibility to try an innovation before adoption, even on a limited basis, will reduce the uncertainty and increase the likelihood of the adoption;
- Observability: "the degree to which the results of an innovation are visible and communicable to others"; the easier it is for individuals to see and discuss the results of an innovation, the more likely they are to adopt it.

An analysis of 75 articles on Information Systems innovation research was performed by Tornatzky and Klein (1982), and concluded that especially three of the innovation characteristics, relative advantage, ease of use (the opposite of complexity) and compatibility, appear as constant determinants of adoption.

Rogers (1995) also put forward that, apart from the innovation itself, other major factors that influence the diffusion process are how information about the innovation is communicated, as well as time and the nature of the social system into which the innovation is being introduced.

The following table summarises the constructs of the Diffusion of Innovations theory, and compares them to the proposed framework.

The literature review factor	The corresponding category or property of the proposed theory
Perceived relative advantage of an innovation	Consumers - Adoption factors in comparison to existing payments
Perceived complexity of an innovation	Consumers - Adoption factors: Ease of use
Perceived trialability of an innovation	Consumers - Adoption factors: Ability to try
Perceived compatibility of an innovation	*no match found*
Perceived observability of an innovation	*no match found*
How the information about the innovation is communicated	Consumers - Education about benefits Merchants - Education about benefits
Time and nature of the social system into which the innovation is being introduced	Society - Cultural influences

Table 5: Constructs of the DoI theory compared to factors of the theory emerging in this study

Perceived relative advantage is a very important part of the theory proposed in the previous chapter. The system's characteristics will be judged as compared to existing payment systems. The study has explored in detail how users perceive characteristics of other payment systems so that new mobile payments can offer advantages over them. Ease of use is the complexity construct reversed, and the respondents have also commented on the need to try out the new system. Communicating information about the innovation has also emerged in the study, including educating consumers and merchants about the benefits of a new system. The influence of the social system has also emerged in the study.

As can be seen in Table 5, two of the factors proposed by Rogers (1962, 1995), compatibility and observability, are not directly reflected in the proposed framework. They will be discussed in the following Final Discussion chapter after

other models have been reviewed as well, to see if they prove themselves in the data in the additional analysis.

Perceived Characteristics of Innovating (PCI)

Based on Rogers' (1962) and Tornatzky and Klein's (1982) work, both of which were mentioned in the preceding section, Moore and Benbasat (1991) extended the Diffusion of Innovations theory, proposing a model of eight Perceived Characteristics of Innovating, PCI. The model predicts technology adoption in an organizational environment.

The PCI constructs include:

- Relative advantage;
- Ease of use: Roger's (1962) 'Complexity' reversed;
- Compatibility;
- Trialability;
- Image: "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system";
- Visibility:" the degree to which the results of using an innovation are visible to others";
- Result demonstrability: "the degree to which the results of using an innovation are communicable to others";
- Voluntariness: "the degree to which use of the innovation is perceived as being voluntary or of free will".

The first four constructs of the model have already been analysed within the Roger's (1962) model discussion in the preceding section, while the following Table 6 compares the four remaining constructs to the theoretical framework proposed in this study.

The literature review factor	The corresponding category or property of the proposed theory
Image	*no match found*
Visibility	*no match found*
Result demonstrability	*no match found*
Voluntariness	*no match found*

Table 6: Constructs of the PCI theory compared to factors of the theory emerging in this study

As can be seen from Table 6, although the three constructs that the PCI model based on Roger's (1962) Diffusion of Innovations (relative advantage, ease of use, and trialability) have been reflected in the proposed theory's categories (see Table 5), the four new constructs proposed by Moore and Benbasat (1991) do not directly match any of the framework's categories or properties. The suitability of these to the theory will be further discussed after the remaining models have been reviewed, in the Final Discussion chapter (Chapter 8).

Theory of Reasoned Action (TRA)

Theory of Reasoned Action (TRA) is a behavioural model with roots in social psychology. It is used to predict various behaviours, from voting in elections to attending school classes (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). The model puts forward that behavioural intention is a function of both attitudes towards the behaviour, and subjective norms towards the behaviour. As explained by Miller (2005), one's attitudes about the behaviour combined with subjective norms about the behaviour, each with their own weight, will lead to one's intention to perform the behaviour (or not), which will then lead to the actual behaviour. As further explained by Miller (2005), attitudes denote the sum of beliefs about a particular behaviour weighted by evaluations of these beliefs. One's beliefs can be weighted since some of them may be more important to one

than others. Subjective norms on the other hand (Miller, 2005) look at the influence of others in one's social environment on one's behavioural intention. The beliefs of other people can also be weighted by the importance that one attributes to each of their opinions, so some beliefs will influence the behavioural intention more than others.

For some people attitudes will have more importance in affecting their behavioural intention, while for others subjective norms may carry more weight, especially if they care more about what others think (Miller, 2005).

To sum up, the TRA constructs include:

- Attitudes: "the degree to which the person has a favourable or unfavourable evaluation of the behaviour in question";
- Subjective norms: "social pressure toward performing (or not performing) the behaviour".

The following Table 7 compares these constructs to the theory that has emerged in this study.

The literature review factor	The corresponding category or property of the proposed theory
Attitudes	*no match found*
Subjective norms	*no match found*

Table 7: Constructs of the TRA compared to factors of the theory emerging in this study

Neither of the constructs in the TRA model has been reflected in the proposed theory, and therefore, their suitability will be further examined in the following chapter.

Theory of Planned Behaviour (TPB)

The Theory of Reasoned Action was revised and extended by Ajzen himself (Ajzen, 1991) into the Theory of Planned Behaviour. One new construct was added to the model to predict behavioural intention and actual behaviour. The construct is called perceived behavioural control, and it denotes an individual's perceptions on the presence of factors that may facilitate or impede performance of the behaviour, and the perceived power of these factors; in other words, it refers to the presence or absence of requisite resources and opportunities to perform the behaviour (Ajzen, 1991). The TPB incorporates the construct to address situations in which individuals lack substantive control over a specific behaviour (Ajzen, 1991). The more favourable the attitudes and subjective norms and the greater the perceived control, the stronger the person's intention to perform the behaviour in question (Ajzen, 1991).

To sum up, the TPB constructs include:

- Attitudes: "the degree to which the person has a favourable or unfavourable evaluation of the behaviour in question";
- Subjective norms: "social pressure toward performing (or not performing) the behaviour";
- Perceived behavioural control: an individual's perceptions on the "presence or absence of requisite resources and opportunities" to perform the behaviour.

The following table compares the new construct to the theoretical framework proposed in this study, while the first two constructs were analysed within the TRA discussion in the preceding section.

The literature review factor	The corresponding category or property of the proposed theory
Perceived behavioural control	*No match found*

Table 8: Constructs of the TPB compared to factors of the theory emerging in this study

Perceived behavioural control is not directly reflected in the proposed theory, and will be compared to the data and other constructs in the next chapter.

Technology Acceptance Model (TAM)

Davis's (1989) Technology Acceptance Model is another extension of Theory of Reasoned Action (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). It has been extensively used to analyse user's adoption of various information systems. TAM sees perceived ease of use and perceived usefulness as fundamental determinants of user acceptance. Ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort", and usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). These two variables form a person's attitude toward using the technology, and influence intention to use a system, which, in turn, correlates with actual use. The model uses measurement scales for both ease of use and usefulness (Davis, 1989).

To sum up, the TAM constructs include:

- Ease of use: "the degree to which a person believes that using a particular system would be free of effort";

- Usefulness: "the degree to which a person believes that using a particular system would enhance his or her job performance".

The following table compares the TAM constructs to the proposed theory.

The literature review factor	The corresponding category or property of the proposed theory
Perceived ease of use	Consumers - Adoption factors: Ease of use
Perceived usefulness	*no match found*

Table 9: Constructs of the TAM theory compared to factors of the theory emerging in this study

Ease of use has emerged as an important adoption factor for consumers. Usefulness, as such, is not one of the constructs proposed in the theory but rather, it has been decomposed into specific features that make mobile payment systems useful. This will be discussed further in the following chapter with all the other literature factors that have not been reflected in the proposed theory.

Decomposed Theory of Planned Behaviour (DTPB)

An extension of the abovementioned TPB model, but with decomposed belief structures, is Decomposed TPB (Taylor & Todd, 1995). This model combines theoretical constructs from TAM (Davis, 1989) and Diffusion of Innovations (Rogers, 1962) with TPB (Ajzen, 1991) - all of which have been discussed earlier - and proposes eight antecedents to the original TPB constructs. Studies have shown that monolithic belief structures, representing a variety of dimensions, are not consistently related to the antecedents of intention (Taylor & Todd, 1995). Such monolithic structures therefore have been decomposed into more detailed belief constructs, pointing to more specific factors that may influence behaviour.

The decomposition can provide a stable set of beliefs that can be applied across a variety of settings (Taylor & Todd, 1995). The detailed belief constructs are summarised below, along with the original construct that has been decomposed.

The DTPB constructs corresponding to attitude:

- Ease of use;
- Usefulness;
- Compatibility.

The DTPB constructs corresponding to subjective norms:

- Peers' attitude;
- Superiors' influence;
- Self-efficacy: "an individual's self confidence in his or her ability to perform a behaviour".

The DTPB constructs corresponding to perceived behavioural control:

- Resource facilitation;
- Technology facilitation.

The table on the following page compares the constructs to the categories and properties of the emerging theory.

The literature review factor	The corresponding category or property of the proposed theory
Ease of use	Consumers - Adoption factors: Ease of use
Usefulness	*no match found*
Compatibility	*no match found*
Peers' attitude	*no match found*
Superiors' influence	*no match found*
Self-efficacy	*no match found*
Resource facilitation	*no match found*
Technology facilitation	Technology - Available features of devices Technology - Available technologies

Table 10: Constructs of the DTPB compared to factors of the theory emerging in this study

The factors of ease of use, usefulness and compatibility have already been discussed within other models. Peers' attitude, superiors' influence, self-efficacy, and resource facilitation are the DTPB factors that have not emerged from this study's data, and will be discussed further in the following chapter.

Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) theory (Venkatesh et al., 2003) was developed after a review and comparison of eight models that had been employed in research to explain technology usage behaviour. The theories include Theory of Reasoned Action, Technology Acceptance Model, motivational model, Theory of Planned Behaviour, a combined TPB/TAM, model of PC utilization, Diffusion of Innovations, and social cognitive

theory. UTAUT is a unified theory that integrates elements across the eight models. It puts forward four key constructs that directly determine usage intention and behaviour: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et. al., 2003). Four other constructs, gender, age, experience, and voluntariness of use, are assumed to mediate the impact of the four key constructs on usage intention and behaviour (Venkatesh et al., 2003). Both UTAUT, and the previous models that it is built upon, have been empirically tested and validated in numerous applications (Mallat, 2004). The previous models were able to successfully predict the acceptance of an innovation in about 40 percent of the cases whereas the new proposed model, UTAUT, was shown to be 70 percent accurate at predicting user acceptance of information technology innovations (Venkatesh et al., 2003). The UTAUT factors are summarised below:

- Performance expectancy: "the degree to which an individual believes that using the system will help him or her better attain significant rewards";
- Effort expectancy: "the degree of ease associated with the use of the system";
- Social influence: "the degree to which the individual perceives that important others believe he or she should use the new system";
- Facilitating conditions: "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system";
- Age;
- Gender;
- Experience;
- Voluntariness of use.

The following table compares the UTAUT constructs to the theory emerging in this study.

The literature review factor	The corresponding category or property of the proposed theory
Performance expectancy	*no match found*
Effort expectancy	Consumers - Adoption factors: Ease of use
Social influence	*no match found*
Facilitating conditions	*no match found*
Age	*no match found*
Gender	*no match found*
Experience	*no match found*
Voluntariness of use	*no match found*

Table 11: Constructs of the UTAUT theory compared to factors of the theory emerging in this study

Only one of the UTAUT factors, ease of use, is directly reflected in the proposed theory. The remaining factors will be further analysed and compared to the data in the following chapter.

Task-Technology Fit (TTF)

Another theory that may be relevant to the current study is the Task-Technology Fit (TTF) model that holds that a technology is more likely to have a positive impact on individual performance and be used if the capabilities of the technology match the tasks that the user must perform (Goodhue & Thompson, 1995). According to Goodhue and Thompson (1995), tasks are actions carried

out that turn inputs into outputs; in the context of this study, a task would refer to making a payment.

The theory is based on the assertion that for a technology to have a positive impact on individual performance, the technology needs to be utilized, and it must be a good fit with the tasks it supports (Goodhue & Thompson, 1995); in other words, the new technology must fit the requirements of a particular task.

Goodhue and Thompson (1995) developed a measure of task-technology fit that consists of eight factors: quality, locatability (ease of determining what data is available and where), authorization (allowing access to data that is needed when it is needed), compatibility, ease of use of the system, production timeliness, system's reliability, and relationship with users. Each factor is measured using between two and six questions with responses on a seven-point scale ranging from "strongly disagree" to "strongly agree". The constructs of the Task-Technology Fit theory are summarised below:

- Quality;
- Locatability: "ease of determining what data is available and where";
- Authorization: "allowing access to data that is needed when it is needed";
- Compatibility;
- Ease of use;
- Production timeliness;
- System's reliability;
- Relationship with users.

These factors are compared to the proposed theory in the following table.

The literature review factor	The corresponding category or property of the proposed theory
Quality	*no match found*
Locatability	*no match found*
Authorization	*no match found*
Compatibility	*no match found*
Ease of use	Consumers - Adoption factors: Ease of use
Production timeliness	*no match found*
System's reliability	*no match found*
Relationship with users	*no match found*

Table 12: Constructs of the TTF theory compared to factors of the theory emerging in this study

Only one factor, ease of use, is common to both the Task-Technology Fit theory and the theory that has emerged in this study. The remaining factors will be further investigated in the following chapter.

Theory of Network Externalities

There are numerous products and services for which the utility that the user derives from using the product or service increases with the number of agents utilizing this product/service. The utility that a user derives from using a telephone, for example, depends on the number of other users using this telephone network (Katz & Shapiro, 1985). According to Katz and Shapiro (1985), such network externalities are present for many communication technologies, and therefore they are considered in this study as well.

The value of membership in the network is a function of the number of the network's members. An individual user is more likely to join the network if, based on an estimated size of the network, they perceive value of joining the network as high (Economides, 1996).

Network benefits can be divided into direct and indirect ones (Au & Kauffman, 2007). The former are due to a technology allowing the interaction with numerous other users. The latter arise since the more users are included in the network, the more technology manufacturers are encouraged to keep producing goods and services that are compatible within the network (Au & Kauffman, 2007).

The following table compares the Theory of Network Externalities to the theoretical framework proposed in this study.

The literature review factor	The corresponding category or property of the proposed theory
High number of the network's members	Consumers - Adoption factors: High number of users Merchants- Adoption factors: High number of users

Table 13: Constructs of the TNE compared to factors of the theory emerging in this study

The Network Externalities theory has been confirmed in the data in this study. Numerous participants confirmed that the value of a mobile payment system will increase the more users such a system will have. Additionally, the more consumers use the system, the more merchants may want to adopt it too; the more merchants adopt it, the more consumers may be likely to join the network.

7.3 Theories Explaining Adoption and Diffusion of Mobile Payments or Related Services

The previous section analysed various technology adoption and diffusion theories since they are assumed to be applicable to all information technologies, and therefore, mobile payments as well. This section will look at the theories that deal with mobile payments and related fields. Because research explaining mobile payment adoption is quite limited (mainly Dahlberg & Mallat, 2002; Dahlberg et al., 2003a; Dahlberg et al., 2003b; Mallat et al., 2005; Mallat, 2006; Ondrus et al., 2005; Ondrus & Pigneur, 2006a; and Ondrus & Pigneur, 2006b), as it was at the beginning of this study (see Section 1.3), studies from related applications are also reviewed, including mobile data services, mobile commerce, mobile banking, as well as financial services.

TAM extensions

When used in new fields of study, Technology Acceptance Model (Davis, 1989), discussed in the preceding sections, has often been adapted or expanded to suit the characteristics of the specific technology. According to Serenko and Bontis (2004), the major advantage of TAM is that it can be used as the basis for building acceptance frameworks in very narrow areas. It can be extended by using domain-specific constructs when used with newer technologies. Such TAM extensions in mobile payments and related fields are exemplified below.

TAM was, for example, used in the electronic commerce field by Lee et al. (2001b) in their e-Commerce Adoption Model (e-CAM), as well as extended by Gefen et al. (2003). TAM was also adapted to mobile services as Compass Acceptance Model (CAM) by Amberg et al. (2003). Furthermore, it was applied to mobile portals by Serenko and Bontis (2004). To explain the adoption of mobile

parking, Pedersen (2003) used the Theory of Planned Behaviour (TPB) along with TAM.

The study of consumer adoption of third generation mobile multimedia services was undertaken by Pagani (2004). The results showed that perceived usefulness, ease of use, price, and speed of use are the most important determinants of adoption of multimedia mobile services, in that order. They also show that the importance of determinants differs by age groups or segments.

In their mobile commerce study, Lee and Jun (2005) modified the usefulness variable into contextual perceived usefulness (defined as "the degree to which a person believes that receiving context-relevant information or services would enhance his or her purchase performance"), and added the perceived playfulness construct. Lin and Wang (2005) added three constructs to TAM used to predict intention to use mobile commerce: perceived credibility, self-efficacy ("judgements how well one can execute courses of action required to deal with prospective situations"), and financial resources.

Dahlberg et al. (2003a, 2003b) called their adaptation of Technology Acceptance Model to study mobile payments Trust-Enhanced TAM. These researchers used focus group method to probe consumer opinions and experiences of mobile payments in detail. Ease of use and usefulness were confirmed as important adoption factors, followed by trust, as well as universality (wide acceptance) and cost.

The constructs proposed above, as well as numerous other constructs found in the literature about adapting Technology Acceptance Model (Davis, 1989) to mobile payments and related fields, along with the authors of the studies, are

compiled below. As revealed above, many studies proposed new categories to suit the particular field, and confirmed the two original dimensions, ease of use and usefulness.

Factors that negatively affect adoption by users:

- Attractiveness of alternative (Mallat, 2006);
- Cost (Amberg et al., 2003; Dahlberg et al., 2003a, 2003b; van der Heijden, 2002; Lin & Wang, 2005; Kleijnen et al., 2004; Mallat et al., 2005; Mallat, 2006; Pousttchi, 2003; Pagani, 2004);
- Risk (Chen, 2006; van der Heijden, 2002; Lee et al., 2001b; Mallat, 2004; Mallat et al., 2005; Mallat, 2006).

Factors that positively affect adoption by users:

- Compatibility (Chen & Adams, 2005; Chen, 2006; Dahlberg & Oorni, 2006; Mallat et al., 2005; Mallat, 2006);
- Context (Mallat et al., 2005);
- Convenience (Chen, 2006; Dahlberg & Oorni, 2006; Dewan & Chen, 2005; Pousttchi, 2003);
- Credibility (Lin & Wang, 2005);
- Enjoyment (Pedersen, 2003);
- Expressiveness (Pedersen, 2003; Serenko & Bontis, 2004);
- Mobility (Amberg et al., 2003; Mallat, 2004; Mallat et al., 2005);
- Network externalities (Mallat, 2006);
- Observability (Chen & Adams, 2005);
- Playfulness (Lee & Jun, 2005);
- Privacy (Chen, 2006; Dewan & Chen, 2005);
- Security (Chen, 2006; Dewan & Chen, 2005; Pousttchi, 2003);
- Self-efficacy (Lin & Wang, 2005);

- Social influence (Dahlberg & Oorni, 2006; Kleijnen et al., 2004; Mallat et al., 2005);
- Speed of transaction (Chen, 2006; Dahlberg & Oorni, 2006; Dewan & Chen, 2005; Pagani, 2004);
- System quality (Kleijnen et al., 2004);
- Trialability (Chen & Adams, 2005);
- Trust (Dahlberg et al., 2003a, 2003b; Dahlberg & Oorni, 2006; Gefen et al., 2003; Mallat, 2004; Mallat et al., 2005; Mallat, 2006; Serenko & Bontis, 2004);
- Universability (Dahlberg et al., 2003a, 2003b);
- Value (Serenko & Bontis, 2004).

All these factors are compared to the existing theory in the following table.

The literature review factor	The corresponding category or property of the proposed theory
Attractiveness of alternative	Consumers - Adoption factors in comparison to existing payments
Cost	Consumers - Adoption factors: Low cost
Risk	Consumers - Adoption factors: Trust/ confidence
Compatibility	*no match found*
Context	*no match found*
Convenience	Consumers - Adoption factors: Convenience
Credibility	*no match found*
Enjoyment	*no match found*
Expressiveness	*no match found*
Mobility	Consumers - Adoption factors: Ubiquity

Network externalities	Consumers - Adoption factors: High number of users
Observability	*no match found*
Playfulness	*no match found*
Privacy	Consumers - Adoption factors: Privacy
Security	Consumers - Adoption factors: Security
Self-efficacy	*no match found*
Social influence	*no match found*
Speed of transaction	Consumers - Adoption factors: Speed
System quality	*no match found*
Trialability	Consumers - Adoption factors: Ability to try
Trust	Consumers - Adoption factors: Trust/Confidence
Universability	Consumers - Adoption factors: Ubiquity
Value	*no match found*

Table 14: Constructs proposed in the TAM extension studies compared to factors of the theory emerging in this study

Some of the constructs proposed in the literature directly reflect the factors of the proposed theory. These include, for example, cost, trust, convenience, privacy, or speed of the transaction. It must be noted that in relation to cost, the proposed theory uses the term *Low cost* to describe this *Consumers' adoption factor*, as low cost is a necessary condition for success, not the other way around. Some literature factors, after their meanings presented by their originators have been reviewed, have been matched with the proposed theory's factors that may have a different name, but essentially refer to the same concept. This includes, for example, mobility matching ubiquity, or attractiveness of alternative matching the comparison of consumer adoption factors to existing payment systems.

The remaining factors that have not been confirmed in this study's data (for example, technology anxiety, context, enjoyment, or playfulness) will be discussed in the following chapter.

Factors driving u-commerce

An integration of electronic systems to support customer service and business operations leads to u-commerce, which, according to Watson et al. (2002), is driven by four constructs: ubiquity, uniqueness, universality, and unison.

The four constructs are explained by Junglas (2003) as follows:

- Ubiquity: "enabling the users to access the network from anywhere at any time, and in turn, to be reachable at any place and any time";
- Uniqueness: "enabling the users to be uniquely identified, not only in terms of their identity and associated preferences, but also in terms of their geographical position";
- Universality: "the common standards that ensure that mobile devices are functional around the world, without regards to geographical locations";
- Unison: "the retrieving of data and information that are integrated across multiple platforms, systems, networks and applications with any devices that provide consistent data and information".

Table 15 on the following page compares these constructs to the emerging theory. As revealed in the table, the importance of all the u-constructs proposed by Watson et al. (2002) and Junglas (2003) have been confirmed in the current study. Consumers want mobile payment systems to be available everywhere, give them flexibility to account for their preferences, and to be based on common standards to create a seamless, integrated experience in various places, situations, and using various devices.

The literature review factor	The corresponding category or property of the proposed theory
Ubiquity	Consumers - Adoption factors: Ubiquity
Uniqueness	Consumers - Adoption factors: Flexibility
Universality	Consumers - Adoption factors: Standardization
Unison	Consumers - Adoption factors: Standardization

Table 15: Constructs proposed as the drivers of u-commerce compared to factors of the theory emerging in this study

Innovation versus infrastructure factors

Damsgaard and Gao (2004) argued that a common feature of many adoption models is their focus on characteristics of new technologies (innovations) that the user perceives. Such models propose specific factors, for example ease of use, usefulness, or compatibility that a new technology must have to become widely adopted by users. Some of these models also take into account the effect of characteristics of the user - such as gender, age, or experience with similar systems.

Damsgaard and Gao (2004) put forward that in more complex, networked technology, such models do not provide enough explanatory power. In their study of mobile telecommunications market, the authors observed that the presence of desired adoption characteristics in the product or service is not enough to explain successful diffusion of innovations (Damsgaard & Gao, 2004).

According to this theory, what is missing in the traditional models is the discussion of infrastructure traits of an innovation. The existing adoption and

diffusion models focus on end-users only, but not on other key players. Infrastructural features of new technology are not taken into account in traditional models. Damsgaard and Gao (2004) therefore proposed that apart from traditional user acceptance studies, researchers also need to focus on such issues as roles of other stakeholders in promoting innovation, social network around the technology, business models, role of institutions such as legislative, taxation, and regulatory bodies, or effects of network economics (the value of new technology increases with the number of adopters).

Such infrastructure traits of an innovation that, according to Damsgaard and Gao (2004), need to be studied to explain adoption and diffusion of technological innovations, are summarised and compared to the emerging theory in the following table.

The literature review factor	The corresponding category or property of the proposed theory
Roles of stakeholders	Providers - Understanding players' strengths and capabilities
Social network	Society - Cultural influences
Business models	Providers - Devising suitable revenue models
Role of regulatory, legislative, and taxation bodies	Authorities - Legal issues Authorities - Taxation issues
Network economics	Consumers - Adoption factors: High number of users Merchants - Adoption factors: High number of users

Table 16: Constructs of the infrastructure traits theory compared to factors of the theory emerging in this study

The theory proposed by Damsgaard and Gao (2004) has been completely verified in this study. The data confirms that such a variety of perspectives is necessary to study adoption and diffusion of mobile payments, and that focusing only on characteristics of the system that matter to end users may not be enough to explain successful implementations.

Competitive and contingency factors

Another theory that may be relevant in this study holds that changes in technological, social/cultural, commercial, and government/legal factors impact the diffusion of financial services development (Jayawardhena & Foley, 2000) and global e-commerce (Javalgi & Ramsey, 2001). Dahlberg and Mallat (2002) used these two models to describe factors which characterize mobile payment services markets and impact the diffusion of these services. The four factors - technological environment, social/cultural environment, commercial environment, and legal environment - are called "contingency factors" in their model since they create the environment for the adoption of new mobile payment solutions (Dahlberg & Mallat, 2002). The researchers added four additional factors to their theory, called "competitive factors": consumer power, retailer power, alternative payment solutions, and increasing competition. The factors are compared to the proposed theory in Table 17 below.

The literature review factor	The corresponding category or property of the proposed theory
Technological environment	Technology perspective categories
Social/cultural environment	Society perspective categories
Commercial environment	*no match found*
Legal environment	Authorities - Legal issues
Consumer power	Consumers perspective categories

Retailer power	Merchants perspective categories
Alternative payment solutions	Consumers - Adoption factors in comparison to existing payments
Increasing competition	Providers perspective categories

Table 17: Competitive and contingency constructs compared to factors of the theory emerging in this study

The theory proposed above has been confirmed in this study's data, with the exception of the commercial environment construct. The theory does not seem to point to specific factors, but rather to general perspectives that need to be taken into account in analysing mobile payments. They correspond to the perspectives around which the categories in the proposed theory are organized: *Technology*, *Society*, *Authorities*, *Consumers*, *Merchants*, and *Providers*. The "Alternative payment solutions" construct is not seen as a separate perspective in this study, but rather as a dimension of the *Consumers' adoption factors* category. Such factors need to be compared to the same features in alternative solutions, and this is how such alternative solutions have emerged as important in this study.

Moderating factors

Lee et al. (2004) claimed that technology models focus on individual characteristics to explain individual adoption behaviours, and intention is regarded as the sole determinant of individual technology adoption. TAM-based studies belong to this group. Some other studies widened the search beyond the individual characteristics by identifying technological, social, and economic factors (Lee et al., 2004). Based on such extended views, the authors identified four factors that directly influence or moderate other factors' influence on individual adoption of mobile payment technology.

The four proposed factors (Lee et al., 2004) include:

- Behavioural intention to adopt m-payment technology, which itself can be influenced by such factors as effort/performance expectancy, or social influence;
- Technology anxiety, which is related to an individual's emotional feeling about new technologies, and involves user's tendency to be uneasy, apprehensive, or fearful about the current use of technology (since m-payment is new and payment-related, a higher level of anxiety can exist);
- M-payment technology infrastructure maturity, which is the degree to which technical infrastructure exists to support use of m-payment technology (e.g., wireless infrastructure);
- M-payment liquidity, which refers to the number and type of concerned economic agents who accept and use m-payment technologies.

The factors are compared to the proposed theory in the following Table.

The literature review factor	The corresponding category or property of the proposed theory
Behavioural intention	Consumers - Adoption factors
Technology anxiety	*no match found*
M-payment technology infrastructure maturity	Technology - Available Technologies
M-payment liquidity	Consumers - Adoption factors: High number of users Merchants - Adoption factors: High number of users

Table 18: Proposed constructs compared to factors of the theory emerging in this study

Behavioural intention, according to Lee et al. (2004), is influenced by various users' adoption factors. Technology infrastructure matches one of the categories

of the proposed theory while the definition of liquidity, as provided by Lee et al. (2004), reveals that it matches the condition of high number of users of the system. Technology anxiety is not reflected in the proposed theory, and will be discussed in the following chapter.

Technology versus user-oriented factors

Bina and Giaglis (2005), in their mobile data services study, observed that the adoption factors can be divided into technology-related ones (reflecting capabilities of technology to support easy-to-use and usable mobile services), and user-oriented factors that include individual characteristics, such as demographics, context of use, propensity for technological innovation, as well as user's quality of life.

Apart from the technology-related factors discussed in other models, the user-oriented factors proposed by Bina and Giaglis (2005) are summarised and compared to the emerging theory in the following table.

The literature review factor	The corresponding category or property of the proposed theory
Demographics	*no match found*
Context of use	*no match found*
Propensity for technological innovation	*no match found*
User's quality of life	*no match found*

Table 19: User-oriented constructs compared to factors of the theory emerging in this study

The user oriented factors proposed above have not emerged in the proposed theory. Demographics, context of use, propensity for technological innovation,

and user's quality of life will therefore be further explored in the following chapter.

Multi-criteria approach

Ondrus et al. (2005) as well as Ondrus and Pigneur (2006a) argued that a complete analysis of the mobile payment services market should take into account various interrelated perspectives such as the market (value propositions and customers segments), the actors, and the actors' agendas. Following this proposal, Ondrus and Pigneur (2006b) adopted a multi-actor, multi-criteria approach in order to analyse the market from such multiple perspectives. Their criteria are summarised below, and while some of them are self-explanatory, the remaining ones include a short explanation:

- Reliability: the purchase process should be flawless;
- User/market acceptance: the degree to which the user and the different stakeholders are already consenting to accept a technology for payment;
- Flexibility: the degree to which the technology can be adapted in numerous various applications, since, for example, payments can be conducted at the POS but also remotely from somewhere else;
- Value proposition improvement: the improvement a technology could bring to the customer when implemented;
- Scalability: the ability of the payment systems to grow in time (in terms of the number of customers and merchants);
- Ease of use;
- Security;
- Cost;
- Maturity of technology;
- Speed.

The constructs are compared to the proposed theory in Table 20 below.

The literature review factor	The corresponding category or property of the proposed theory
Reliability	*no match found*
User/market acceptance	Consumers - Adoption factors Merchants - Adoption factors
Flexibility	Consumers - Adoption factors: Flexibility
Value proposition improvement	*no match found*
Scalability	*no match found*
Ease of use	Consumers - Adoption factors: Ease of use
Security	Consumers - Adoption factors: Security
Cost	Consumers - Adoption factors: Low cost
Maturity of technology	Technology - Available features of devices Technology - Available Technologies
Speed	Consumers - Adoption factors: Speed

Table 20: Constructs of the multi-criteria theory compared to factors of the theory emerging in this study

Many of the factors proposed by Ondrus and Pigneur (2006b) have been confirmed in this study as well, including adoption factors, flexibility, ease of use, security, low cost, and speed. The remaining factors will be further analysed in the following chapter.

Additional success factors

The literature search has identified numerous other studies that did not propose or extend any models or theories, and were mostly speculative, but they would

still offer some useful insights about the mobile payment success factors, usually included in their general discussions on mobile payments. This search focused on discovering as many publications on mobile payments as possible, aiming for completeness and using techniques described in the Introduction chapter in Section 1.3.

Standardization

Standardization of mobile payment solutions has been often proposed as a critical success factor. Datamonitor (2003) argued that the lack of common standards is the key factor suppressing the m-payment market. Moreover, it may seem that too many proprietary solutions have only confused customers. Because of proprietary approaches, there is no one coherent roadmap or framework for the future of mobile payments, and this may lead to market fragmentation and delay its growth (Ding & Unnithan, 2003). Henkel and Zimmermann (2002) saw standardization as the more difficult issue than technology in m-payments. As pointed out by these authors, the payment network is like a telephone network in the way it becomes more valuable to all users, the more users it has, which favours one dominant solution. According to Henkel (2001), an agreement on one common open standard would be ideal for the success of m-payment. Ding and Hampe (2003a), after Forrester Research, stated that three major issues that prevent mobile payments from taking off are lack of customer trust, partnerships struggling over terms of collaboration, and a lack of standardized user-friendly infrastructure. Ding and Unnithan (2003) mainly blamed lack of standards and security within both devices and networks for the slow development. Familiarity and security can be ensured by the same level of standardization that governs physical payment cards use (Mobile Payment Forum, 2002).

Interoperability

Krueger (2001b) put forward that a large number of non-interoperable schemes may restrict the adoption of m-payments, and hence the development of m-commerce. Such a view was supported by S. Costello (2002), who maintained that the payment, transactions and authorization components of mobile commerce are being held back because of many different systems that do not work together.

Collaboration between players

Hort et al. (2002) argued that banks and mobile operators do not have to compete with one another. The most successful business models could be those based on strong partnerships between the two key players. Partnerships were viewed as essential by Kountz (2002) as well. Kountz (2002) saw backing from both a financial institution and one or more carriers as a prerequisite for success. Wallace (2002), who also saw cooperation as the key issue, attributed early success of Paybox (German m-payment solution) to its partnerships with both banks and operators. The author saw a well-supported standard, with cooperation from both key players, as crucial to provide perceived security, which is the key to success of mobile payments. Jupiter Research (2002) similarly recommended choosing providers with strong links to both telecom operators and banks.

Vilmos and Karnouskos (2003) presented a design of a new m-payment system, and the basic principle of their business model is the cooperation between banks and mobile operators. The benefits are maximization of revenues, combination of customer bases, and combination of transaction potentials. Existing infrastructures can be integrated. The banks in this particular system will deal

with macropayments (payments above $10), and mobile operators will process micropayments. This seems a viable and promising proposition.

As far as solutions offered by independent providers are concerned, even though he acknowledged their speed, innovativeness, and flexibility, Henkel (2001) did not think that such new companies have enough strength to establish payment systems on their own. The author argued that such independent companies do require partnership of banks or mobile operators.

Security and Trust

Successful mobile payment solutions have to be secure. Henkel (2001) and Kreyer et al. (2002b) viewed security as one of the most important success factors in mobile payments. Confidentiality, authentication, integrity, authorization, and non-repudiation of mobile payments must be ensured (Buhan et al., 2002). MET (2001) also recommended that the following security issues must be solved to ensure success of an m-payment solution: confidentiality to keep information private, authentication to prove identity of both individual and application, integrity to prove that information has not been manipulated, and authorization (digital signing).

In Pousttchi's (2003) study, 96% of the respondents indicated that confidentiality of data is important to them. Confirmation of payment and possibility of cancellation were considered important by 89% and 86% of the participants respectively. According to Egger and Abrazhevich (2001), trust in any payment system is influenced by anonymity, security, reliability, the amount of control that users have, and the reputation of the entity that introduces the system.

Dahlberg et al. (2003a, 2003b), in their focus group interviews, confirmed the importance of security and trust. Six different types of security risks in mobile payments were identified: unauthorized use, transaction errors, lack of transaction record and documentation, vagueness of the transaction, privacy issues, and device and mobile network reliability. These perceived security risks affected negatively the attitude towards using mobile payments. Banks were seen the most trustworthy providers of m-payments in these studies (Dahlberg et al., 2003a, 2003b).

Buhan et al. (2002) argued that fulfilling the security conditions is not enough - consumers must be convinced that such conditions are met. Wallace (2002) also believed that security is the key factor, both in terms of reality and perception.

Cost

Cost is one of the three mobile payment success factors, next to convenience and security, according to Kreyer et al. (2002b). Cost was also proposed as one of Pousttchi's (2003) commensurate acceptance conditions. Buhan et al. (2002) maintained that costs could slow down the development of mobile payments. These could be both costs to consumer, and costs to set up a new system. Northstream (2002) also pointed out that the user needs an incentive to use a new procedure since they are used to existing systems. Additional benefits should be made clear to the user, and these can include reduced cost. Vilmos and Karnouskos (2003) also saw additional value of mobile payments in reduced cost.

Not having to purchase a new mobile phone was rated as very important or important by 83% of respondents in Pousttchi's (2003) survey. In the same study, only 8.5% of the respondents were willing to accept more than €5 as a yearly fee

for a mobile payment service. Only one third of respondents accepted the use with a transaction fee of €0.10 (Pousttchi, 2003). In focus groups of Dahlberg et al. (2003a, 2003b), participants were not willing to use new systems if the costs were higher than for conventional payment solutions.

Ease of use

Poropudas (2002) argued that end-user experience is "everything". Mobile payments should be thought of as a service, and this service has to be good.

In Pousttchi's (2003) study on conditions for acceptance of m-payment procedures, 93% of the respondents found easy handling important, and 81% indicated that the ease of learning about a system is important.

According to Dahlberg et al. (2003a, 2003b), in their focus group interviews issues related to ease of use were frequently brought up. Ease of use was seen as the most important aspect of mobile payments, even more important than usefulness. The service was considered difficult if it involved registration or opening of a separate account. The interviewees also thought that it was hard to find information about new m-payment solutions. They thought that the methods using SMS to pay would lack the ease-of-use.

Speed

In Pousttchi's (2003) study, 91% of the respondents found fast processing important. Northstream (2002) also pointed out that benefits that could provide incentives to use a new m-payment procedure for consumers used to existing procedures include reduced time. Vilmos and Karnouskos (2003) pointed out that reduced transaction time adds value to mobile payments. Time was seen as a critical factor by Dionisio et al. (2001). M-commerce is unlike e-commerce

where the user usually has the time to sit down and connect to the Internet. The network is also unstable and unpredictable so the faster the transaction is completed, the better (Dionisio et al., 2001). Buhan et al. (2002) argued that mobile operators must somehow convince consumers of their new procedure by offering strong value propositions, such as more efficient or faster payments.

Global reach

Buhan et al. (2002) pointed out that the good solutions would be able to interact with other solutions to create a global payment network. Krueger (2001a) also predicted a demand for "payment roaming", and the pressure from users for co-operative solutions. Such payment roaming would include the user wanting to make payments while travelling outside of their network coverage.

Convenience

Buhan et al. (2002) defined accessibility as an essential success criterion in mobile payments, and they further divided it into convenience, speed, and ease of use. According to JupiterResearch (2002), convenience is essential, and paying by phone must be at least as convenient as by any other mechanism.

Personalised, location sensitive, and time specific services

Buhan et al. (2002) argued that strong value proposition of mobile payments could include payments becoming personalised, location sensitive, or enabling rush purchases. McPherson (2004) also predicted that m-payments would expand more quickly when location-based services such as traffic reports are available, which would provide a new value. D. Costello (2002) agreed that the content delivered to mobile users must be personalized, as well as location and time specific.

Social and cultural influences

Relevant research reports and studies within related fields (other payment services or wireless communication) have addressed specific social and cultural issues that may be important to mobile payment studies. These include distinguishable payment cultures in various countries, industry strengths, electronic banking readiness of consumers, strong mobile phone inclination of certain nations (Bohle & Krueger, 2001), demographics and lifestyle characteristics, or cultural differences in developed and developing countries (Mahmood et al., 2004). Payment cultures differ in various countries, for example the cash-centric culture of Japan, the account/giro-centric cultures of Germany and Scandinavia, and the wide use of cheques in the USA and France (Bohle & Krueger, 2001). Adrian (2003) stresses that mobile payment systems must focus on very specific culture and locale.

Other factors

Buhan et al. (2002) listed device and network limitations, maturity of other payment solutions, and customers' lack of interest as the barriers to diffusion of mobile payments. The authors also blamed fear of unknown medium as the reasons for customer's apathy. Customers may feel uncomfortable to try a new procedure. According to Henkel (2001), product success factors for the user include quick and easy setup, low technical requirements, building upon established payment methods, offering extended services, and availability of variety of applications.

Mobile Payment Forum (2002), after Forrester Research, listed some other obstacles in mobile payments, suggested by surveyed users: credit card security, fear of "clunky user experience", "don't understand how it works", and "never heard of it before". Telecom Media Networks (2003) proposed four mobile

payment success factors: merchant penetration, customer penetration, effective partnership, and integration with core business. Poropudas (2002) considered the following key elements to successful m-payments: positioning it as a core element, usability, and providing realistic business case for all involved.

Pousttchi (2003) defined essential conditions as those that cause a user to accept an m-payment procedure as usable in principle, while fulfilling one of the commensurate conditions would make them actually use this procedure. In order of relevance, he found confidentiality of data, costs, convenience issues (easy handling, fast processing), and coverage as the most relevant. Pre-registration is not of high-priority, as well as picopayments (amounts below 20 cents), and a person-to-person scenario. Commensurate conditions include obtaining some Informational Added Values (IAV) such as efficiency, effectiveness, as well as aesthetic-emotional, and flexibility values.

One reason for the low demand for mobile payments may be slow growth of mobile commerce, according to Jones (2003). Economic climate, especially in the telecommunication sector, does not favour investments either. What is more, mobile payments simply do not offer enough advantages over other payment systems (Jones, 2003).

Mallat et al. (2005) presented preliminary results from a study of mobile ticketing service in Helsinki public transportation. Their empirical findings from survey data suggested that compatibility of technology and consumer behaviour is a major determinant of adoption. Contextual factors, including budget constraints, availability of other alternatives, time pressure in the service use situation, and features of the required service were also found to have a strong effect on adoption.

There have been several studies that have also explored the merchants' attitudes to mobile payments. Three of them uncovered the various barriers to the merchant adoption (Mallat & Tuunainen, 2005; Teo et al., 2005; van der Heijden, 2002). Researchers found barriers such as high costs (transaction fees), complexity (ease of use), lack of relative advantage, low compatibility, and the interdependence between consumers and merchants at an early stage of development.

The following Table 21 summarises the success factors proposed in the literature, and at the same time compares them to the categories and properties of the emerging theory.

The literature review factor	**The corresponding category or property of the proposed theory**
Advantages over other payment systems	Consumers - Adoption factors in comparison to existing payments
Aesthetic-emotional values	*no match found*
Availability of variety of applications	Consumers - Adoption factors: Ubiquity
Building upon established payment methods	*no match found*
Business cases	Providers - Devising suitable revenue models
Collaboration between players	Providers - Cooperation between players
Compatibility for consumers	*no match found*
Compatibility for merchants	*no match found*
Confidentiality of data	Consumers - Adoption factors: Security Consumers - Adoption factors: Trust /Confidence
Consumer penetration	Consumers - Adoption factors: High number of users

Consumers' lack of interest	*no match found*
Context of a payment (budget, alternatives, time pressure)	*no match found*
Convenience	Consumers - Adoption factors: Convenience
Cost	Consumers - Adoption factors: Low cost
Coverage	Consumers - Adoption factors: Ubiquity
Cultural differences in developed and developing countries	Society - Cultural influences
Demographics	*no match found*
Device limitations	Technology - Available features of devices
Ease of use	Consumers - Adoption factors: Ease of use
Ease of use for merchants	*no match found*
Economic growth favouring investments	*no match found*
Effectiveness	*no match found*
Efficiency	*no match found*
Electronic banking readiness of consumers	*no match found*
Explanation on how it works	*no match found*
Fear of unknown medium	Consumers - Adoption factors: Ability to try
Features of the required service	Consumers - Adoption factors Merchants - Adoption factors
Flexibility values	Consumers - Adoption factors: Flexibility
Global reach	*no match found*
Growth of mobile commerce	*no match found*
Increased awareness about m-payments	*no match found*
Industry strengths	Providers - Understanding players' strengths and capabilities

Integration with core business	*no match found*
Interoperability	*no match found*
Lifestyle characteristics	*no match found*
Low technical requirements	*no match found*
Maturity of existing payment solutions	Consumers - Adoption factors in comparison to existing payments
Merchant penetration	Merchants - Adoption factors: High Number of Users
Network limitations	*no match found*
Offering extended services	*no match found*
Partnerships	Providers - Cooperation between players
Payment cultures in various countries	Society - Cultural influences
Personalised, location sensitive, time specific services	*no match found*
Quick and easy setup	*no match found*
Relative advantage for merchants	*no match found*
Security	Consumers - Adoption factors: Security
Specific culture and locale	Society - Cultural influences
Speed	Consumers - Adoption factors: Speed
Standardization	Consumers - Adoption factors: Standardization
Strong mobile phone inclination of certain nations	Society - Number of mobile phone users
Transaction fees for merchants	Merchants - Adoption factors: Low cost
Trust	Consumers - Adoption factors: Trust/Confidence
Usability	Merchants - Adoption factors: Ease of use

Table 21: Success factors found in the literature compared to factors of the theory emerging in this study

As can be seen in Table 21 above, numerous literature factors validate the categories or properties in the theoretical framework proposed in this study. They closely match the proposed categories, for example, partnerships, consumers' cost, trust, ease of use, or standardization. The remaining factors from the literature that have not been confirmed in this study's data will be discussed in the following chapter.

Players' strengths and capabilities

As the emerging theory in this study revealed, an important condition for success of mobile payments is the understanding of strengths and capabilities of various players that they may bring into partnerships. Numerous papers and industry reports analysed such strengths of various players, and their findings are reviewed below.

Mobile operators

Mobile network operators are often considered natural candidates for offering mobile payments because of their large customer bases (Henkel, 2001; Krueger, 2001a; Northstream, 2002; Jupiter Research, 2002). Furthermore, this ownership of customers is very tight, and mobile operator brands are strong (Jupiter Research, 2002). Operators have access to consumers through handsets, so this relationship is direct and privileged (Buhan et al., 2002). Henkel (2001) also emphasized the strength of operators' relationship with consumers.

Another important issue was reported by Krueger (2001a) and Northstream (2002). Vast experience with billing, combined with their technical expertise, is likely to help mobile operators succeed in the mobile payment field. The infrastructure already exists to charge customers for services that they or others provide. Similarly, Buhan et al. (2002) emphasized operators' experience with

collaborating with numerous service and content providers, and, again, their sophisticated billing and accounting systems. Ahonen (2002) accurately depicted the sophistication of mobile operator's billing systems. As pointed out by this author, operators' current billing and charging systems are like no others in the world. They are able to track every possible detail about each call. Operators know not only the user's location and the network they are in, but even how they move from one coverage area to another. Unlike other industries that consolidate sales, telecommunication companies are able to time, log, and bill every second of airtime (Ahonen, 2002).

Experience with roaming and interoperability are other operators' strengths pointed out by Costello (2003), who argues that network operators are well placed to take advantage of mobile commerce. Their roaming experience can be used for efficient processing of micropayments. Their interoperability in turn can be used to create the required scale. Krueger (2001a) also realized that mobile operators who operate internationally may find it easier to offer international payment systems.

Mobile companies can also enable access to new services because they own the networks (Northstream, 2002). Costello (2003) highlighted the importance of the ownership of licensed spectrum. Because operators can localize the user via their network technology, they can offer location-based services (Krueger, 2001a). Henkel (2001) also argued that because of their SIM card in the user's phone, mobile operators can influence a central piece of technical infrastructure, and so control the device.

Mobile operators seem to be highly motivated to invest in a new service such as mobile payments. As reported by Krueger (2001a), operators are keen to find

new models for revenues to justify their investments into expensive 3G (third generation) networks. This author predicted that mobile payments could become the mobile operators' key sector. It is in their interest to increase both the traffic on their networks, and revenues from the sale of value-added services. The issue of justifying investments in 3G networks was also raised by Costello (2003), who estimated spending for 3G networks in Europe alone at US$250 billion. Henkel (2001) put forward that pure airtime would become a low-margin commodity because of the need to justify the spending on 3G telephony.

There are some challenges that mobile network operators will have to consider before entering this new market. First of all, they could face legal issues (Henkel, 2001; Krueger, 2001a; Buhan et al., 2002). If prepaid phone accounts are to be used to pay for services of other companies, then such accounts become electronic money. Special licenses are then required (Henkel, 2001). In Europe, a required license is issued by the Electronic Money Institute, or EMI (Krueger, 2001a). In some cases, mobile operators would even need to obtain a banking license.

There are also challenges connected with mobile operators adding the charges for mobile commerce on the phone bill. Costello (2003) argued that when third party goods appear on the operator bill, it may create the impression that the operator is expensive, and produce "bill shock". Sometimes operators may be restricted in what they are allowed to put on a bill. The author also pointed out that many businesses pay for employees' voice and data calls, but may not be happy to see increased costs on the bill for non-work related services.

The challenges summarised above (the problems of a banking licence and adding payments to the mobile phone bill) confirm the importance of including banks in mobile payment partnerships to alleviate such problems.

Banks

Trust is one important advantage that financial institutions have in relation to mobile payments. Krueger (2001a), for example, argued that consumers would like banks to continue to be their main payment providers, given the long-established relationship of trust. Customers, according to Buhan et al. (2002), are used to paying through banks. These authors also quote Forrester Research study that found out that most retailers would prefer financial institutions as one of the partners in a payment system. Henkel (2001) also emphasized the banks' high reputation for reliability, and long-standing customer relationships. Ondrus and Pigneur (2005) similarly argued that the advantage that financial institutions have over operators are their brand names since consumers trust and are loyal to classic payment schemes. If banks decided to extend the use of their payment systems to mobile payments, they would have instant recognition from the consumers since they already know the brand, and they have been using it on many occasions without any problems (Ondrus & Pigneur, 2005). They would likely have fewer concerns about security and privacy as banks base their reputations on these quality features (Ondrus & Pigneur, 2005). Dahlberg et al. (2003a, 2003b) reported that in their focus group interviews with customers, banks were seen as the most trusted providers of mobile payment solutions.

Payments are a core business of financial institutions. Northstream (2002) pointed out that banks have long been involved in financial transactions, both in issuing and acquiring, and as clearing houses. They have expertise to handle transactions and risk, the necessary licenses, legacy data systems, and both

merchant and customer bases. Henkel (2001) similarly emphasized banks' experience in payment services and risk management. Another expertise is in cross-border transactions.

According to some authors, banks simply have no choice but get involved in mobile payments. Jones (2003) argued that banks have to deal with mobile payments, since otherwise they will be "'out of the loop". If they let the billing model take over, consumers will not need them since a credit card or bank account will not be necessary.

Independent providers

Independent start-up companies, as pointed out by Hort et al. (2002), could act as intermediaries between consumers, merchants and banks. Moreover, because mobile payments require completely new systems, start-up companies can enter the market as first movers with new sophisticated solutions. They can be more flexible and faster to explore new technologies than mobile operators or banks. The risk of losing reputation is not an issue for them (Hort et al., 2002). On the other hand, such independent players would clearly have to build their customer base from scratch (Kountz, 2002), which confirms the importance of partnerships with mobile network operators or banks.

The following table sums up the strengths that various players can bring into mobile payment partnerships according to the literature findings, and compares them to the findings coming from the data in this study.

The literature review factor	The corresponding category or property of the proposed theory
Operators' large customer bases	Providers – Understanding players' strengths and capabilities: Operators' existing customer bases
Operators' strong brands	*no match found*
Operators' relationships with customers	Providers – Understanding players' strengths and capabilities: Operators' existing customer bases
Operators' technical expertise	*no match found*
Operators' infrastructure	Providers – Understanding players' strengths and capabilities: Operators' infrastructure
Operators' existing partnerships experience	Providers – Understanding players' strengths and capabilities: Operators' existing relationships
Operators' capabilities of sophisticated billing	*no match found*
Operators' interoperability experience	*no match found*
Operators' motivation to justify 3G investments	*no match found*
Operators' localization capabilities	*no match found*
Banks' trust	Providers – Understanding players' strengths and capabilities: Banks' trust
Banks' core payment experience	Providers – Understanding players' strengths and capabilities: Banks' core payments technology
Banks' strong brands	*no match found*

Banks' long-standing relationships with customers	Providers - Understanding players' strengths and capabilities: Banks' customer bases
Independent companies' first movers' advantage	Providers - Understanding players' strengths and capabilities: Independent companies' fast responsiveness
Independent companies' flexibility	Providers - Understanding players' strengths and capabilities: Independent companies' flexibility
Independent companies' speed in exploring new possibilities	Providers - Understanding players' strengths and capabilities: Independent companies' fast responsiveness

Table 22: Players' capabilities from the literature compared to factors of the theory emerging in this study

Some of the players' strengths proposed in the literature match those that have emerged in the current study. Others have not been confirmed in the data at all, and this will be discussed in the next chapter. The literature seems to have focused especially on mobile operators' capabilities, whereas in this project, which included various industry representatives, different stakeholders' strengths were discussed in a more balanced manner.

Mobile payment consortia objectives

As the final literature review stage, various mobile payment consortia and organizations were investigated with the focus on their stated aims and objectives; such aims and objectives must reflect the factors that such organizations believe will improve adoption and diffusion of mobile payments. The reviewed consortia include Mobile Payment Forum, Mobile Electronic Transactions, Mobey Forum, PayCircle, Simpay, and Open Mobile Alliance. The

information about these organizations, including their objectives, was found on their official websites and is compiled in Table 23 below.

Name	Mobile Payment Forum
Industry	cross-industry, but with credit cards focus
URL	http://www.mobilepaymentforum.org/news.htm
Date founded	Nov 2001
Objectives	▪ to create a framework for the deployment of simple, secure and interoperable m-payments; ▪ to prevent further market fragmentation and encourage growth of an interoperable global m-payment market; ▪ to standardize the features and functions needed to deploy secure and convenient mobile commerce solutions using existing payment cards; ▪ to create standards and best practices for every phase of a payment transaction, including the set-up and configuration of the mobile payment instrument, payment initiation, and the authentication and completion of a transaction.
Main members	3, American Express, Visa, MasterCard, JCB, Nokia, NTT DoCoMo, Oracle, Orange, TMobile, Vodafone, NEC
Activities	organize seminars and papers; formed workgroups to start addressing specific m-commerce issues such as cardholder authentication, device and transport security, and consumer convenience and usability; created Wallet Form Fill, Third Party Authentication, or Proximity Payment Activity working groups

Name	MeT (Mobile Electronic Transactions)
URL	http://www.mobiletransaction.org/
Industry	sponsor members: phone manufacturers only; associate members: also mobile operators, financial companies, as well as technology and solution providers
Date founded	April 2000
Objectives	▪ to establish a framework for secure mobile transactions, ensuring a consistent user experience independent of device, service and network; ▪ to create a common platform for developing secure mobile e-commerce services; ▪ to ensure that interoperable mobile transaction solutions are developed around the world - enabling consumers to access goods and services seamlessly wherever they may be with consistent user experience.
Main members	sponsors: Nokia, Sony Erickson, NEC, Panasonic, Siemens; others: Radiolinja, Telefonica Moviles, Telia, France Telecom, Mobey Forum, Wells Fargo Bank, Gemplus, Verisign
Activities	rarely invent own specifications, mainly working on existing standards and technologies; to contribute to the specification work of MeT, expert groups assemble in Associate Member Summits four times a year

Name	Mobey Forum
URL	http://www.mobeyforum.org/
Industry	full members: financial industry and mobile terminal manufacturers only
Date founded	May 2000

Objectives	▪ to encourage the use of mobile technology in financial services, promoting open, non-proprietary technology standards; ▪ to focus on a solution that is suitable for mass-market and provides choice - consumers are not forced to select a specific operator or bank to use the services based on the preferred architecture; ▪ to act as a liaison between various standardization fora in the mobile industry and the financial industry.
Main members	ABN Amro Bank, Nordea, HSBC, Nokia, UBS, Bank of Ireland, the Royal Bank of Scotland, Hitachi, Hewlett-Packard
Activities	based on four workgroups; announced Preferred Payment Architecture in 2001, which is extensive documentation defining both the business and technical aspects of providing user-friendly and secure mobile banking and payment services; in 2002 published Preferred Payment Architecture for Local Payments and demonstrated local mobile transactions

Name	**PayCircle**
URL	http://www.paycircle.org/index.php
Industry	cross-industry
Date founded	
Objectives	▪ to accelerate the use of payment technology and develop or adopt open and interoperable payment APIs (uniform Application Programming Interfaces) based on XML, SOAP, Java and other Internet languages; ▪ to develop an open standard for mobile payment and a uniform application programming interface (API) for mobile payment systems.
Main members	Siemens, HP, Sun, Oracle, SCG Systems
Activities	provide scenarios and white papers; work on Java Community Process (JPay API) and the co-operation with Liberty Alliance Project

Name	Simpay
URL	http://www.simpay.com/index.php
Industry	mobile network operators
Date founded	early 2003
Objectives	▪ to drive m-commerce forward for customers, content providers, merchants and banks by creating an open, interoperable, commonly branded solution for payments by mobile phone; ▪ to offer a universal solution, from a customer, merchant and operator perspective.
Main members	Orange, Telefonica Moviles, Vodafone, T Mobile
Activities	released a global interoperable system, named Simpay, in 2005; the system was later withdrawn

Name	OMA (Open Mobile Alliance); including WAP forum
URL	http://www.openmobilealliance.org/index.html
Industry	mobile operators, Information Technology companies, wireless vendors, and content providers
Date founded	June 2002
Objectives	▪ to deliver high quality, open technical specifications based on market requirements that drive modularity, extensibility, and consistency among enablers to reduce industry implementation efforts; ▪ to define a set of specifications to be used by service applications.
Main members	Nokia, NTT DoCoMo, Openwave, Motorola, Ericsson, IBM, HP, Microsoft, Lucent, T Mobile, Vodafone
Activities	develop mobile service enabler specifications, which support the creation of interoperable end-to-end mobile services; drive service enabler architectures and open enabler interfaces that are independent of the

	underlying wireless networks and platforms; develop test specifications, encourage third party tool development, and conduct test activities that allow vendors to test their implementations

Table 23: Information about various mobile payment consortia compiled from their official websites

The following Table 24 summarises the success factors that have emerged from the analysis of the objectives of mobile payment consortia and bodies, and compares them to the existing theory.

The literature review factor	The corresponding category or property of the proposed theory
Simplicity	Consumers - Adoption factors: Ease of use
Security	Consumers - Adoption factors: Security
Interoperability	*no match found*
Global reach	*no match found*
Standardization	Consumers - Adoption factors: Standardization
Consistent user experience	Consumers - Adoption factors: Standardization
Universality	Consumers - Adoption factors: Standardization
Modularity	Consumers - Adoption factors: Standardization
Extensibility	*no match found*
Choice of providers and banks	Consumers - Adoption factors: Ubiquity

Table 24: M-payment consortia factors compared to factors of the theory emerging in this study

Numerous constructs that are based on the objectives of various mobile payment consortia have been confirmed in this study's data, especially in the

standardization factor. The remaining constructs will be discussed further in the following Final Discussion chapter.

7.4 Chapter Review

This chapter started with an investigation of the role of a literature review in grounded theory methodology, which explained why a literature review should never be conducted before the study starts. Such an approach allowed the researcher in this project to stay free of external influences and pre-conceived concepts, and to build the emerging theory as true to the participants' data as possible.

The literature review was conducted after the initial theory had emerged, and it was used to further shape and refine it. The review started with various theories on the adoption and diffusion of technological innovations in general, and then explored success factors proposed for mobile payments and related fields specifically. The former included the theories of Diffusion of Innovations, Perceived Characteristics of Innovating, Theory of Reasoned Action, Theory of Planned Behaviour, Technology Acceptance Model, Decomposed Theory of Planned Behaviour, Unified Theory of Acceptance and Use of Technology, Task-Technology fit, and Network Externalities. The latter included studies that extended the adoption models to suit mobile payments and other mobile applications, as well as mobile technology publications that discussed innovation versus infrastructure factors, competitive and contingency factors, moderating factors, or technology versus user-oriented factors; finally, numerous additional mobile payment success factors were compiled from various studies.

The constructs proposed in the literature in each model, study, or theory were instantly compared to the emerging theory in comparison tables that would, for each literature construct, either show the corresponding factor from the emerging theory, or indicate that no match had been found in this study's data.

The identified similarities and differences will be analysed in the following chapter. This final discussion will use the results of the comparisons between the literature review and the emerging theory to further refine the theory proposed in this study.

8. Final Discussion

This thesis has provided, over the course of the various chapters, a detailed explanation on how the emerging theory was built, including the details of quality-ensuring, data collection, and data analysis procedures. The previous chapter dealt with the last procedure used to bring the theoretical framework to its final shape: a literature review. This chapter first summarises which of the literature factors identified in the previous chapter confirm the constructs of the proposed theory; it then discusses which of the emerging theory's factors have not been confirmed in other studies, and whether and how it affects the final theory proposed. Subsequently, the opposite process looks at the factors which have been proposed in the literature but have not been confirmed in this study's data; such factors are analysed further using the constant comparison method to see if they should indeed be incorporated into the theory. The refined theoretical framework concludes the chapter.

8.1 Against Forcing of Data

As has been explained at length before, a literature review in this study was only conducted after the emerging theory had already been formulated to a degree, so that the proposed categories were not forced to fit the earlier proposed models from the literature. It is stressed here again that grounded theory aims to discover "what really is", and not what one thinks one should discover because of pre-conceived and imposed notions. Therefore, the literature constructs are analysed in this chapter, but they will only be included in the final theory if they have indeed been confirmed in the data. The data will not be forced to fit such constructs simply because they come from known models or famous authors. Such literature findings, although confirmed in other applications, may, for example, not suit the specific context of mobile payments or this study, or be too general or too specific; finally, some of the earlier findings may not be based on any empirical research but rather on their authors' assumptions.

8.2 Factors Confirmed in Data and Literature

The following Figure 25 presents which factors of the proposed theory have been confirmed in the literature as well. Such factors are shaded on the diagram.

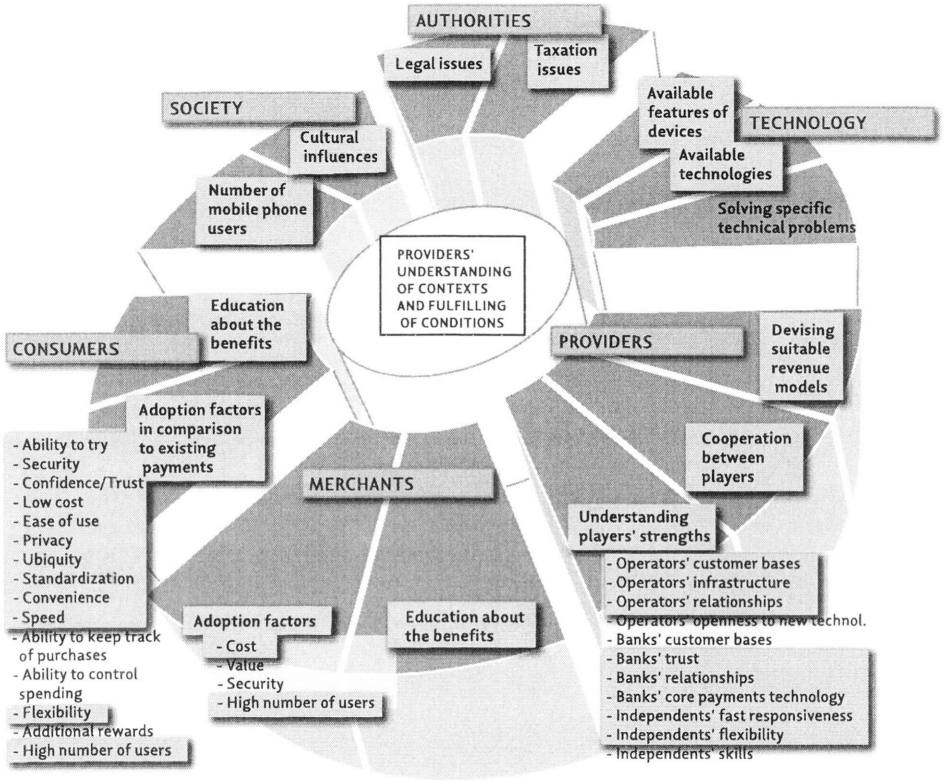


Figure 25: Highlighted codes that have been confirmed in literature

All the perspectives (*Providers, Technology, Authorities, Society, Consumers*, and *Merchants*) have been confirmed in the literature, and most of the categories and properties in each perspective have been confirmed as well. This highlights the importance of the current study. Many of the authors proposed just several success factors, missing numerous other influences that have emerged in the current project. The previous studies proposed fragmented solutions, and what

was missing was a holistic framework of all the influential factors. The earlier studies did not discuss relationships between the factors either, and did not propose practical recommendations related to each factor, both of which this study aimed to address.

In addition, this project proposed more suitable names for many factors that have been found in literature – the names used in this theory are based on the participants' data, and therefore, they are believed to be more relevant and true to the actual phenomena. Such constructs include, for example, *Confidence*, *Low cost*, *High number of users*, or *Education on the benefits*.

The factors of the emerging theory that have not been confirmed in the literature review are discussed in the following section.

8.3 Factors Emerged from Data but not Confirmed in Literature

Factors summary

The following factors have not been proposed by previous studies:

- *Consumers – Adoption factors: Ability to keep track of purchases*
- *Consumers – Adoption factors: Ability to control spending*
- *Consumers – Adoption factors:: Additional rewards*
- *Technology – Solving specific technical problems*
- *Providers – Understanding players' strengths and capabilities: Mobile operators' Openness to new technologies*
- *Providers – Understanding players' strengths and capabilities: Banks' Customer bases*

- *Providers – Understanding players' strengths and capabilities: Independent companies' Skills*
- *Merchants – Adoption factors: Value*
- *Merchants – Adoption factors: Security*

Discussion

The importance of ***Ability to keep track of purchases*** and ***Ability to control spending*** has been mentioned on numerous occasions by the participants. These factors often emerged even when the participants were not asked specifically about these features, but were just generally queried about their experiences with payment procedures. The reviewed literature focused on various information systems and what users want from such systems, but payments systems may have unique features that would not matter in other systems; this could explain the lack of mention of these features in the adoption and diffusion literature. The literature studies that researched mobile payments specifically did not focus on other existing payment methods and their characteristics that matter to users, hence the possible overlooking of these factors as well. Both factors have been verified in the data coming from the participants, and both have emerged as important to the users; therefore they are proposed to remain as part of this study's theory.

The Consumers' ***Additional rewards*** construct has not been mentioned in this form in the literature. It seems that the closest match to this factor is Value proposed by numerous researchers. This value, however, as will be shown in the next section, has been in this study decomposed into many specific value-bringing factors, such as low cost, speed, and others. Additional rewards refer to loyalty and rewards programs that, as the study has revealed, matter a lot to consumers, as exemplified especially by their attitudes to credit cards. A

consumer may choose a new method of payment based solely on the loyalty program offered, hence the importance of this factor in mobile payments. It is proposed, however, that this factor be renamed as *Rewards programs* to better reflect what it refers to since the literature review analysis has revealed that "Additional rewards" may be too confusing and too similar to value, benefits, or usefulness. It is important then to stress that this factor refers specifically to rewards and loyalty programs that a user can be offered when using a new mobile payment instrument.

As the previous chapter revealed, many researchers suggested the advancement of devices and other technologies as factors affecting successful implementations of mobile payments. The factor that has been formulated in this study, ***Solving specific technical problems***, has not been directly proposed in the literature. It is suggested here that this is due to the literature factors being more generalized. Researchers referred to new technologies, technological advancements, and possibilities offered by technologies, but without specifying providers' relation to these. This study has revealed that the issues should possibly be decomposed into a) understanding of the available technologies context and making the best use of them in mobile payments, as opposed to b) the condition of solving some specific technological problems that need to be tackled to implement successful solutions. The former deals with implementing the already available technologies properly, while the latter concerns specific problems with technologies to which solutions need to be found. This seems to better explain the technology issue for providers than constructs that refer to maturity of technology generally.

Some of the providers' strengths have not been confirmed in any previous studies either. The three properties have been checked against the data again,

and, as the result, it is proposed that the ***Independent companies' skills*** construct be removed from the theory. Even though it has been mentioned often in the answers, the close analysis of the collected data revealed that it was usually independent providers who claimed this strength for themselves. Discussions on other strengths seemed to be evenly spread between respondents from banks, operators, and independent companies, and various stakeholders confirmed the importance of large ***Customer bases of banks***, and ***Mobile operators' openness to trying new technologies***.

Finally, two ***Merchants' adoption factors*** have not been confirmed in the literature. It has to be pointed out that there have only been four studies about merchants' adoption, coming from two research groups. ***Security*** has not been mentioned in those studies, yet it has emerged as an important adoption factor for merchants who seem worried about liability in fraudulent transactions. ***Value,*** however, is possibly too general, and this is why it may not have been proposed in the previous studies. The value construct may not actually reveal what it is that brings value to merchants. This factor then will be decomposed into more specific features in the following section, where the additional factors proposed for merchants in the literature are discussed.

Conclusion

The following summary presents the factors that have been modified after the above analysis:

- *Consumers - Adoption factors: Ability to keep track of purchases* = > not changed
- *Consumers - Adoption factors: Ability to control spending* = > not changed
- *Consumers - Adoption factors:: Additional rewards* = > *Rewards Programs*
- *Technology - Solving specific technical problems* = > not changed

- *Providers - Understanding players' strengths and capabilities: Mobile operators' Openness to new technologies* = > not changed
- *Providers - Understanding players' strengths and capabilities: Banks' Customer bases* = > not changed
- *Providers - Understanding players' strengths and capabilities: Independent companies' Skills* = > removed
- *Merchants - Adoption factors: Value* = > will be decomposed
- *Merchants - Adoption factors: Security* = > not changed

8.4 Factors Proposed in Literature but not Confirmed in Data

The factors discussed in the previous section have been discovered in the data, but not in the literature; this section deals with the opposite cases of factors discovered in the literature but not in the data. It seemed important to analyse such cases further and have a close look at the data again, this time with these factors in mind, to see if some issues have not been overlooked.

Factors summary

The summary of the factors that have been revealed in the preceding literature review chapter follows in Table 25; they have been organized into loose groups of related categories. This has only been done to make it easier to discuss them when they are related because of the high number of factors.

Literature review factors that have not emerged in the data
enjoyment
playfulness
aesthetic-emotional values
result demonstrability
visibility
perceived observability of an innovation
observability
subjective norms
peers' attitudes
social influence
superiors' influence
expressiveness
image
voluntariness, voluntariness of use
global reach
interoperability
quality, system quality
reliability

banks' strong brands
operators' capabilities of sophisticated billing
operators' interoperability experience
operators' localization capabilities
operators' motivation to justify 3G investments
operators' strong brands
operators' technical expertise
usefulness
value, value proposition improvement
performance expectancy
efficiency
effectiveness
compatibility, compatibility for consumers, perceived compatibility of an innovation
compatibility for merchants
low technical requirements
network limitations
resource facilitation
facilitating conditions
perceived behavioural control

age

gender

user's quality of life

lifestyle characteristics

demographics

technology anxiety

experience

propensity for technological innovation

self-efficacy

attitudes

consumers' lack of interest

commercial environment

growth of mobile commerce

economic growth favouring investments

electronic banking readiness of consumers

explanation on how it works

increased awareness about m-payments

locatability

quick and easy setup

authorization

credibility
offering extended services
building upon established payment methods
production timeliness
relationship with users
personalised, location sensitive, time specific services
context, context of a payment, context of use
context (time pressure, budget constraints, available alternatives)
integration with core business
scalability, extensibility
ease of use for merchants
relative advantage for merchants

Table 25: Summary of the factors discovered in literature but not in the emerging theory

Discussion

Some researchers proposed **enjoyment**, **playfulness**, or **aesthetic values** as factors that positively influence user adoption of information systems. Enjoyment (Pedersen, 2003) was, for example, proposed as important in mobile portals, and playfulness in mobile commerce (Lee & Jun, 2005). The respondents in this study have not commented at all on enjoying or having fun using any mobile or traditional payment systems. Although this factor may be important for users of mobile portals or mobile commerce sites, this does not seem to be the case for

the particular task researched in this study – payments. Payments do not seem to be something users do for enjoyment. Enjoyment, aesthetic value of the system, or playfulness do not seem to be the features that mobile payment users will require. Enjoyment is considered instrumental of services primarily designed for entertainment (Leung & Wai, 2000), which does not apply to mobile payments.

Several other factors proposed in the literature refer to the user being able to observe the results of the innovation when others use it (**demonstrability**, **visibility**, or **perceived observability of an innovation**). This issue has not emerged in the discussions either about mobile payments or other payments used by the respondents. This could, again, be attributed to the nature of the payment process, where the results are hard to observe by others. The process of the user typing on a small device or similarly paying with a credit card or any other payment method is hard to observe by others; the user may actually make an effort not to be observed because of confidentiality of a payment process.

A number of researchers have pointed out the importance of peers' attitude or social influence on the intention to use a system. The system may improve a person's image, or let one express who they are. Such proposed factors include **subjective norms**, **peers' attitude**, **social influence**, **superiors' influence**, **voluntariness of use**, **expressiveness**, or **image**. Superiors' influence is clearly not applicable to mobile payments that are not used in an organizational context, and the same applies to voluntariness of use. The collected data and the memos have been further analysed in light of the social or peers' influence issue. It has been confirmed that this factor has not emerged at all in the data collected. The nature of the payment process may again suggest that it is not something users would do based on fashion or what others do, or to express who they are.

The collected data was also explored again with **global reach** and **interoperability** factors in mind. A closer examination of the data coded into *Standardization* and *Ubiquity* codes has revealed that these codes possibly need to be decomposed further to account for the interoperability issue. *Ubiquity* factor originally referred to the system being accepted everywhere, for all kinds of payments, in various locations and scenarios (*"can be taken and used anywhere").* Standardization referred to the user expecting the same consistent procedures (*"it's always the same steps no matter where you are"),* especially based on their experience with debit and credit cards. Originally, interoperability was included in the proposed theory as part of the *Ubiquity* construct; the additional comparison of the data though has suggested that including it as an additional factor is warranted. The term *International interoperability* seems to best describe what the factor refers too - the ability to use mobile payment systems across the borders, or while travelling to other countries. The new factor does seem important in the mobile payment environment since the respondents seem to have international interoperability expectations and experience with both mobile phones and payment cards (*"When I travel abroad, I can use my phone in most places with no problems - if such payment systems worked there too, it would be great",* or *""When I visited Germany and Paris, I used my debit card the whole time").* Therefore, even though originally the factor was part of the ubiquity category, the additional analysis suggests that *International interoperability* should be a separate factor of the proposed theory.

System's quality and **reliability** have also been proposed as important adoption factors. When the data was scanned again with these factors in mind, it was revealed that these constructs have already been accounted for in the *Security* and *Trust* categories. For users to trust the system, they expect reliable and secure transactions, and, as the respondents pointed out, they need to trust that

the transaction goes through, that network connection problems are accounted for, and that receipts and confirmations are presented - all of which means that the system must be reliable. Dahlberg et al. (2003a, 2003b) classified device and network reliability as one of the six different types of security risks in mobile payments. It is suggested, therefore, that reliability is part of the *Security* and *Trust* factors. In the proposed theory both *Security* and *Trust* are put forward as necessary adoption factors, where *Security* refers to the actual features that need to make the system secure, hacker-proof, or reliable, while *Trust* refers to the consumers' psychology and their being convinced that the system is actually secure, hacker-proof, and reliable.

The literature has also discussed strengths and roles of the industry players as possible mobile payment providers. The literature factors that have not been confirmed in the data include **banks' strong brands**, and the constructs concerning mobile operators: **capabilities of sophisticated billing**, **interoperability experience**, **localization capabilities**, **motivation to justify 3G investments**, **strong brands**, and **technical expertise**. The additional comparison of the data with these constructs in mind did not confirm their relevance. It must be noted that many comments in the study were coming from independent companies who would offer balanced comments about both banks' and operators' strengths in the existing partnerships, yet these particular claims have not been put forward. The differences could be due to the fact that the constructs proposed in the literature come from conceptual papers that were not based on empirical studies (Henkel, 2001; Krueger, 2001a; Northstream, 2002; Jupiter Research, 2002; Buhan et al., 2002), and they were also published five or more years ago, when mobile payments were just appearing and when adding payments to mobile phone bills seemed to be the most common form of a mobile payment; hence

the focus on mobile operators as m-payment providers. As for the banks' strong brands, this factor seems to be well covered under the *Banks' trust* factor.

Another group of factors proposed in the literature reviewed in the previous chapter deals with **usefulness**, **efficiency** and **effectiveness** of the system, **increased value**, or **performance expectancy**. Both Davis's (1989) TAM and Venkatesh et al.'s UTAUT (2003) models have proposed and validated these constructs. The former refers to perceived usefulness, defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989), while the latter includes the factor of performance expectancy: "the degree to which an individual believes that using the system will help him or her better attain significant rewards" (Venkatesh et al., 2003). The TAM construct needs to be interpreted differently in the mobile payment context, since the original model refers to systems in organizations. Job performance would have to be replaced with everyday performance. Both of the factors then refer to the system enhancing a person's performance in everyday life, and helping them to achieve some rewards. The theory proposed in this study confirms the importance of the m-payment system enhancing the user's performance, and helping them to achieve some rewards - the proposed theory, however, decomposes the factor into much more detailed features, and instead of referring to "some rewards", it incorporates specific factors that do represent such rewards. Instead, then, of specifying usefulness as a very general factor, where it may not be clear what it actually means in any system, and what the rewards and useful value for the user are, this theory has discovered the specific factors that together make the system more useful to the user. Such factors include *Low cost, Speed, Ability to control spending*, or *Rewards programs*, for example. If a mobile payment system offers these features to the user, they will be able to improve their payment process, gain additional value from it, and

"attain significant rewards" (Venkatesh et al., 2003). Therefore, it is believed that more detailed classification will better explain factors necessary to improve adoption and diffusion of mobile payment systems.

An important factor in the literature, proposed first by Rogers (1960), seems to be **compatibility** of the system. Rogers (1960, 1995) defines compatibility as "the degree to which an innovation is perceived as being consistent with the existing values, norms of a social system, past experiences, existing practices, and needs of potential adopters". The factor seems to be very general again, encompassing numerous specific features of the system, which would suggest why it has not emerged in this study. Existing values and needs form a significant part of the proposed theory, and compatibility with the values and needs of both consumers and merchants is an essential success factor for mobile payment systems providers. This factor is reflected in a) the core category that refers to the need of providers to understand the contexts and fulfil the conditions, and b) such contexts and conditions categories that include consumers' needs, merchants' needs, social cultures, existing payment systems, and others. Therefore, it does not seem necessary to formulate a separate compatibility factor.

Other factors proposed in the literature refer to the **low technical requirements of a system**, **resource facilitation**, **behavioural control**, or **facilitating conditions** for the user, as well as **network limitations**. Apart from the network limitations factor, the remaining constructs are general, referring to various enabling technologies. The original theory in this study proposed that it is important for providers to understand and make the best use of available features of devices, and other available technologies, which is similar to the literature factors of resource facilitation, facilitating conditions, or low technical requirements. Network limitations could warrant a separate category, to distinguish it from

general "other available technologies". The comparison method has been used on the data collected to see if network technologies do warrant a separate category in the framework. This has suggested that although network issues have been categorized together with other technologies before, they may need to be made more explicit and included as a separate factor in the theory. Some comments from the participants included: *"issues related to the disparity in wireless technology adoption"*, *"with dual mode (3G + wifi) handsets, why not provide a way to make mobile payments over wifi when available, thus completely bypassing the operator"*, *"explore the differences between Bluetooth, RFID, NFC"*, *"provide a consistent service across networks,"*, or *"the various types of competing connection technologies."* Such network technologies, therefore, refer both to mobile networks, including 3G ones, but also WiFi and short range technologies such as Bluetooth, RFID, NFC, and others. Therefore, it is suggested that providers need to understand how to best use a) the available features of mobile devices, b) available network connection technologies, and c) other technologies that will include, for example, new security technologies or protocols. Therefore, the *Technology* perspective will include those three context categories.

Some researchers pointed out the importance of the user's characteristics on the adoption of an information system. These included, for example, user's **quality of life** (Bina & Giaglis, 2005) or their **lifestyle characteristics** (Mahmood et al., 2004). Some users may also have less **experience** with the technology (Venkatesh et. al., 2003), higher **technology anxiety** (Lee et al., 2004), or less **propensity for technological innovation** (Bina & Giaglis, 2005). **Self-efficacy** refers to "an individual's self confidence in his or her ability to perform a behaviour" (Taylor & Todd, 1995). Demographics such as **age** or **gender** may influence the user's attitude towards the system (Venkatesh et al., 2003). In terms of the technology

experience and anxiety it must be noted that generally users who already have experience with mobile phones would not have problems using their phones for payments. There are those who do not use mobile phones or have problems using them, but this is already accounted for in the category of *Number of mobile phone users* and such people without mobile phones would not be potential users of mobile payments anyway. The current study did not reveal the influence of the user's characteristics, including their age or gender, on their attitudes towards mobile payments. The age, gender, country of residence, and occupation were recorded but the data analysis did not reveal any patterns in the users' attitudes based on those. Among both females and males, and among people of various ages and living in various countries, there were both those who were excited about the idea of paying with their mobiles, and those who were not willing to try it. Differences in terms of various groups finding some features more important have not emerged. This is not to suggest, however, that such differences do not exist at all, but rather that they are not significant enough to emerge from such a qualitative study. It might be possible to detect some variations using a detailed quantitative study that would statistically compare the responses of hundreds of users, from a statistically representative sample. This can be, therefore, suggested as a future research direction to further supplement the current study. Such research could use all the consumers' adoption factors identified in this project, and in a large quantitative study across nations, age groups, and occupations, compare the results for the various groups. Such a study, however, is clearly beyond the scope of this, already detailed and time-consuming study. Still, the important contribution of this study on the demographics perspective is that there are no obvious differences in the attitudes of various groups that would be visible in the qualitative data analysis.

Two of the factors proposed in the literature, **attitudes** and **consumers' interest**, even though not made explicit, are accounted for in the proposed theory. The consumers' attitudes and their interest towards mobile payments are believed to positively influence their actual use of the systems; the two factors seem too general though to provide any meaningful implications. Attitudes of the users have been examined closely in the study, and have been presented as a number of adoption factors. Requirements of the low cost, ease of use or speed, for example, all constitute the users' attitudes towards mobile payment systems, and are believed to increase their interest in the new procedures. Attitude, according to Ajzen (1991), is "the degree to which the person has a favourable or unfavourable evaluation of the behaviour in question", and this study has revealed which specific features users require to have a favourable evaluation of a system.

Another group of the literature factors includes issues such as **commercial environment**, **economic growth favouring investments**, **electronic banking readiness of consumers**, or **growth of mobile commerce**. The only societal factors that have emerged earlier from the data include *Cultural influences*, and the *Number of mobile phone users* in a society. The commercial and economic environment factors have been further examined in the comparison method on the collected data. The factors have not been confirmed in the data, however. None of the industry participants mentioned the commercial environment in a given country or economic situation of the country as the factor that affected the success or the lack of success in their mobile payment implementations. Growth of mobile commerce may not be an important factor either as mobile payments are used in a variety of other scenarios, including physical POS, vending machines, and others. The main commercial factor seems to be the mobile

phone usage of the society' members, and this factor has already been accounted for in the proposed theory.

Two literature factors, **explanation on how it works** and **increased awareness about mobile payments**, seem similar to the proposed theory construct of *Education about the benefits* to consumers and merchants. After the data has been analysed again with these issues in mind, an important matter appears to be not only explanation of benefits to the users, but also clear explanation on how mobile payments work and what they are. It seems that because it is a new technology, many users do not understand it, and therefore may be less likely to use it (for example, *"I don't know how"*, *"no idea how it would work"*, or *"I would just need some extra explanation on how to use the service"*). The additional analysis therefore has revealed that the theory should differentiate between *Education on the benefits*, and *Education on how mobile payments work*.

Some factors from the literature seem to already be incorporated into other factors of the proposed theory. These include, for example, **locatability** (ease of determining what data is available and where), or **authorization** (allowing access to data that is needed when it is needed), proposed by Goodhue and Thompson (1995). Locatability is part of the *Ease of use* since finding required features easily is one of the main ease of use characteristics. **Ease of set-up** is another factor that is part of the *Ease of use*. Authorization is a significant, but not the only one, part of *Security* factor. **Credibility** is part of the *Trust/Confidence* category. **Offering extended services** is covered under the *Ubiquity* factor, where a system is likely to be used by consumers if it can be used in a number of scenarios, locations, and to pay for various products and services. **Building upon established payment methods** has also been an important part of the proposed

theory, and is reflected in all the consumer adoption factors' necessity to be compared to other payment methods.

Some of the remaining literature factors seem to offer explanatory power for other information systems, but seem not to be well suited for the mobile payment context, which would explain why they have not emerged from the data analysis. **Production timeliness of data** (Goodhue & Thompson, 1995) is not something that happens in payment systems, even thought it may be important in other fields, such as mobile or electronic commerce. Similarly, **relationship with users** was defined by Goodhue and Thompson (1995) as delivering agreed-upon solutions, IS understanding of business, or technical and business planning assistance - all clearly organizational issues, not in the domain of everyday life and individual's making payments. The possibility of a mobile phone to provide **personalized, location-sensitive, or time-specific services** is often mentioned in relation to other services it may offer, but it seems, based on this study, that claiming the same for mobile payments may not be true. Location or time-sensitive services may be important for mobile commerce, mobile marketing, and other applications where it seems useful to offer a relevant service depending on where the user is and when, but mobile payments should be something that a user can initiate anytime, anywhere, without the service being pushed to them.

Context of use, or specifically **context of a payment situation**, has also been proposed as an important factor affecting adoption of m-payments. This can, for example, include time pressure in a given situation. While context does seem to play an important role in various situations, the proposed theory tries to propose success factors applicable to varied situations, to fulfil the needs of various users and in various scenarios. Many respondents indicated the importance of a fast transaction regardless of a specific scenario. Therefore, it is proposed that

providers should try to fulfil all the required criteria, even if some of them may matter more in some specific situations.

Another factor, **integration with core business**, has not been confirmed in the data even after the additional data analysis. Various providers, including independent companies, banks, and mobile operators have discussed their initiatives with mobile payments, and, as discussed in the theory, each offers various strengths and may have roles to play, even if payments are not the company's core business. The remaining factor, **scalability and extensibility**, is assumed in mobile networks which accommodate billions of users nowadays, and for mobile payments, a growing number of network users is one of the adoption factors accounted for in the theory.

Two more factors have been proposed in the literature as important for **merchants' adoption**: **ease of use**, and **relative advantage.** Ease of use is not confirmed in the current study, even after additional analysis of the data. Merchants seem to find *High numbers of users*, *Low cost*, and *Security* as the important factors, but it seems that they could put up with a more complicated procedure to gain the other benefits. The comparison of the data with the relative advantage factor in mind did reveal, however, that all the proposed factors for merchants should indeed be compared to existing payment procedures used by merchants, similarly to the consumers' adoption factors. Therefore, merchants' adoption factors will be in the theory always compared to existing payment procedures. This will also provide the required value for merchants, since value category seems to be too general and not explaining how this value is provided. The value may be provided to merchants by offering them a cheaper and more secure payment system that many users will be able to use.

Conclusion

This section has analysed various adoption and diffusion success factors that have been proposed in the literature, but had not emerged in the data analysed in this study. As a researcher doing grounded theory should not force their data to fit expected or known theories, some changes have only been suggested if they have been grounded in the data during the additional analysis that compared data to a given factor. The modified theory is depicted in the following Figure 26. The changes are summarised afterwards.

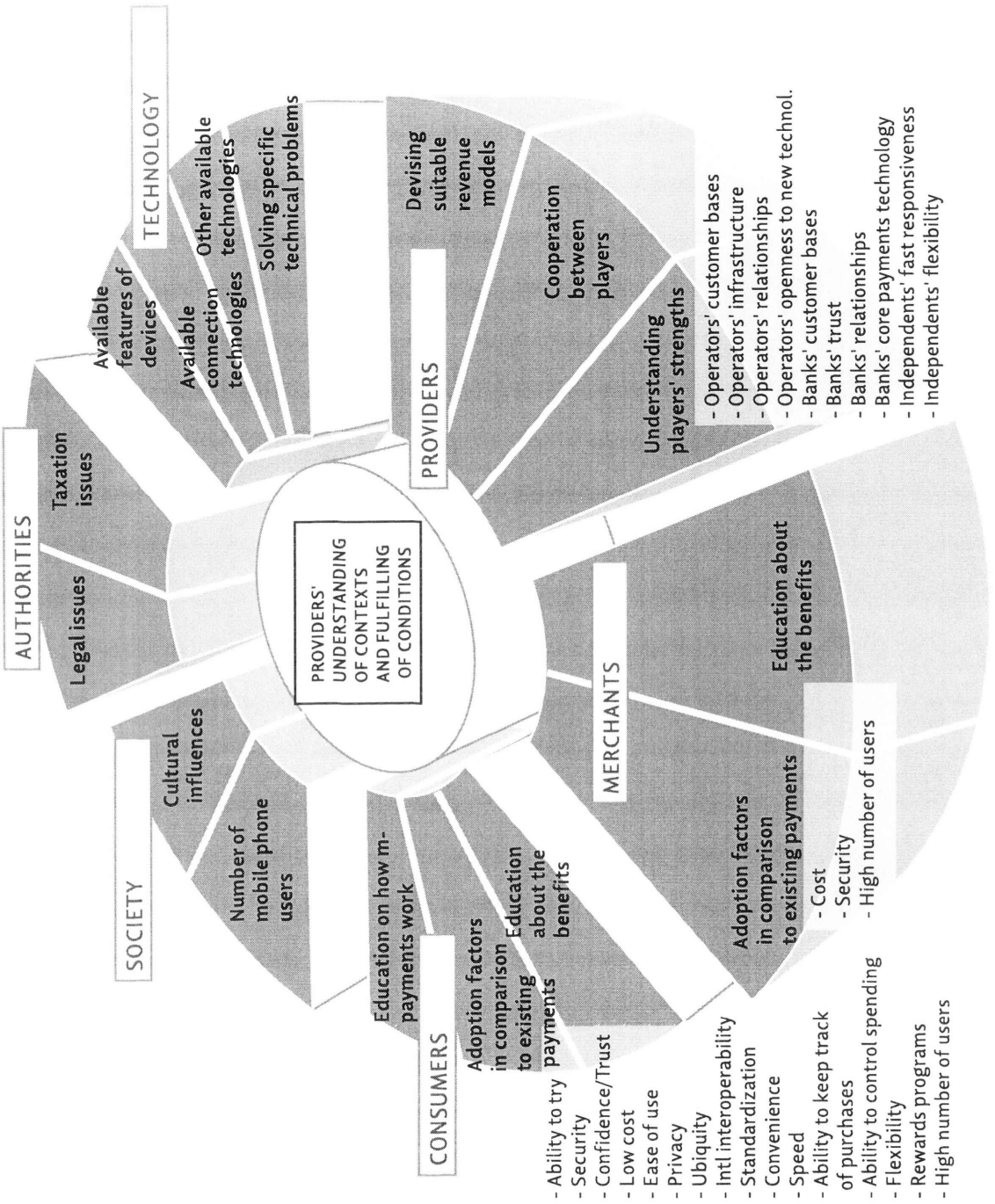


Figure 26: Final refined theoretical model

A new factor, *International interoperability*, has emerged as an adoption factor for consumers, and additional rewards has been reworded as *Rewards programs* to better describe what it refers to. Consumers also need to be educated not only on the benefits of a new mobile payment procedure, but also on how mobile payments work. In *Technology* perspective, a new factor proposed is the *Understanding of available network technologies*. Changes in *Merchants'* perspective include the removal of a value factor that is believed to be too general, and the necessity of comparing the required features to existing payment procedures. The "skills" strength of independent providers is another factor that has been removed after the additional analysis. It has also been suggested that the detailed influence of demographics on the user's attitudes would need to be studied in future research with a sample of statistically representative users and quantitative data.

8.5 Chapter Review

In the previous chapter the literature review factors were identified and compared to the emerging theory. The outcomes of these comparisons were discussed in this part of the thesis. This chapter first summarised the factors that were found both in the literature and in the emerging theory. It then discussed the emerging theory factors that have not been confirmed in the literature. Out of the nine factors, one was removed from the theory after further analysis, one was decomposed further, and one was modified. The remaining factors might have been overlooked in the literature, which confirms the contribution of this study. The factors that have not been proposed before include: *Consumers' adoption factors: Ability to keep track of purchases, Ability to control spending*, and *Rewards programs; Solving specific technical problems; Providers' strengths: Mobile operators' openness to new technologies* and *Banks' customer bases*; as

well as *Merchants' adoption factor* of *Security*. Possible explanations on why previous research has not proposed such factors were offered.

Subsequently, the opposite process looked at the factors which have been proposed in the literature review but have not emerged from this study's data. Some changes to the theory were suggested only if they were sufficiently grounded in the data during the additional comparison method. The new factors proposed include consumers' adoption factor of *International interoperability*, consumers' *Education on how mobile payments work*, providers' *Understanding of available network connection technologies*, as well as the necessity to compare the merchants' adoption factors to existing payment procedures.

This chapter therefore led to the refinement of the theoretical framework that forms the outcome of this study. The final visual model of the theory was depicted. The whole theory will be summarised and interpreted again in the following Conclusions chapter, along with the summary of practical recommendations discovered in all the categories, and implications of such findings. In addition, the Conclusions chapter will provide some retrospective comments on the whole research process.

9. Conclusions

This chapter concludes this thesis. It discusses the main contributions of this research, relating them to the research questions and objectives stated in Chapter 1. It then summarises the main findings, exploring their implications and significance. Finally, it outlines the strengths of this research, relating them to the chapters where they were discussed. Since this chapter summarises, reviews, and concludes this thesis, it does not have its own chapter review section.

9.1 Main Contributions of this Study

Mobile devices have a potential to become ideal payment devices because they are small, light, personal, convenient, and many people carry them anytime, anywhere. Such devices have a number of connectivity options, and their own display and input capabilities. They are already widely used around the world, and their use is already familiar to many people. Mobile payments, however, despite their potential, have not reached the expected adoption levels. There has been a history of failed solutions, early withdrawals from the market, and numerous pilots that have never been implemented.

This gap between the potential of mobile payments and the lack of success highlighted the importance of research in this field. It was also revealed at the beginning of this study that while there may be many reasons for the lack of adoption and diffusion of mobile payments, previous research focused on a few specific topics only, mainly technology and consumers. This suggested that research is needed to discover as many as possible success factors for mobile payments, and the following research questions were asked:

> *What multitude of factors might influence adoption and diffusion of mobile payments, or, in other words, what are the mobile payment success factors? How do such factors relate to each other? What are the specific recommendations and requirements for each of the perspectives?*

The main aim of this study was to find out what is necessary to improve adoption and diffusion of mobile payment systems. Adoption and diffusion was defined as the state of mobile payments being selected for use by numerous users so that they spread to general use and application, and become a popular and widely used payment method. Specific objectives that were proposed to help achieve this aim included: a) identifying all the factors that may influence adoption and diffusion of mobile payments, b) integrating such factors and relations between them in a holistic framework, and c) providing specific recommendations and guidelines in all the various perspectives.

The study managed to answer all the research questions, and fulfil all the objectives. It discovered a multitude of influential factors, their relations, and specific recommendations within each of them. The main contribution of this study is the holistic theoretical framework that explains the specific factors that influence adoption and diffusion of mobile payments, provides interesting

findings on each of the identified factors, and at the same time integrates such investigations together as one coherent whole that forms a roadmap of success factors for mobile payments. The proposed theory can be used by providers as guidance to improve their current systems or to better design new mobile payment systems. The identified success factors are not limited to any specific technology or payment scenario – rather, by understanding the success factors and requirements first, including all the influential conditions and contexts, providers will be able to choose the most suitable technology, payment scenario, or charge method to fulfil the necessary requirements.

This study provides an original and significant contribution to knowledge in the field of mobile payments. Some of the theory factors have not been proposed before at all. Some others have been proposed in fragmented explanations that focused on several influences only. Other factors have been proposed before, but this research offered more accurate or understandable names and interpretations for them. In addition, this study integrated all the factors together in a holistic framework, pointing out contexts and conditions that form categories and properties belonging to specific perspectives. Another important contribution is a multitude of specific guidelines and recommendations that have been discovered in the participants' data. All of the above, including factor names, relations between them, and detailed guidelines come from empirical data and the real world. This study, unlike numerous other mobile payment projects, additionally devoted much attention to studying mobile payments in relation to existing payment methods, which revealed new factors, relations, and guidelines. The high number of failed m-payments solutions suggests that such a theory providing a holistic and applicable roadmap of well explained success factors for mobile payments was missing.

9.2 Implications of Findings

Implications of the proposed theory

The proposed theory identifies and explains factors that providers of mobile payment systems need to understand, account for, and fulfil in order to implement systems that will be adopted by users and that will diffuse. Such factors, for clarity of explanation, are situated within six perspectives. All the perspectives and all the categories within the perspectives are important and cannot be overlooked by m-payment providers. The theory provides a holistic roadmap for successful implementations, and it is important that providers do not focus on just some of the issues identified in the theory. The proposed framework includes all the identified success factors, and each of them has been grounded in the data as influential in improving adoption and diffusion of mobile payments, which means that providers need to address all of them.

The factors are either contexts that need to be understood and taken into account by m-payment providers, or conditions that need to be fulfilled. Understanding of the contexts needs to be used by providers when fulfilling the conditions. For example, to fulfil the speed-of-transaction requirement of consumers, understanding of available connection technologies is necessary to know which technology can provide a fast connection. The condition of educating about the benefits will be better fulfilled if providers understand possible cultural influences in a relevant society, and realize which benefits they should highlight more for a given culture. The condition of devising suitable revenue models again will be influenced and informed by understanding various contexts, such as legal issues, taxation issues, or strengths of each player. Many of the identified consumers' or merchants' requirements, or in other words, adoption factors, can be fulfilled by understanding strengths and capabilities of

partners: banks' trusted brands, for example, may be important in providing m-payment systems that consumers and merchants will trust, and both banks' and mobile operators' existing customer bases may help to provide high number of users that are important to make such systems viable.

Some perspectives, such as Society or Authorities, group contexts only since they are more passive and cannot be directly influenced by providers; others, such as Consumers and Merchants, include conditions since both of them deal with end users of mobile payment systems and providers can directly influence them.

The theory can be used by providers both at a higher level, to understand the categories in each perspective, but also at a more detailed level to find out particular recommendations in each of the categories. It offers specific guidelines, for example, recommending double security protection against identity theft, or the suggestion that merchants will not accept a system with charges higher than those of existing payment methods. The theory also points out which factors give advantage to mobile payments over other payment methods, such as speed and convenience, and which may be the hardest to achieve (trust/confidence, for example), or the hardest to surpass compared to other payment methods (ubiquity or international interoperability).

Most of the specific guidelines and recommendations in this study have been discovered about providers and users (consumers and merchants), since they are the most universal perspectives. The specific issues in the perspective of Authorities (relevant legal directives, for example) and Society (cultural influences, for example) depend on the specific locale, and therefore providers will need to gather information relevant to the place where they implement their mobile payment system.

Factors and specific recommendations that have been discovered in this study as well as their implications are discussed next, grouped within the six perspectives for the clarity of explanation.

Implications in the providers perspective

The providers' perspective includes two conditions: devising suitable revenue models, and the need of cooperation between players; and one context: considering the strengths, or, in other words, capabilities of each party (mobile operator, bank, and independent company) in such cooperation.

Providers need to devise a revenue model for their service that would be profitable to the various parties involved. Especially the existing models used for intangible products, and in particular, those based on premium SMS, are inefficient. Providers need to devise suitable revenue sharing models both for tangible and intangible products.

Cooperation between independent providers, banks, and mobile operators has emerged as the necessary condition for success. If all the three parties were not to partner, other models could be based on cooperation between independent providers and either banks or mobile operators only. Mobile payments not based on partnerships at all however are most likely to fail.

In such collaborations, it is important for providers to understand what each party can offer, or in other, words, what each party's strengths and capabilities are that can be brought into the partnerships. Mobile operators can provide their customer bases, infrastructure, existing relationships, and their openness to new technologies. Banks may bring in their customer bases, consumers' trust, existing relationships, and their core payments technology. Independent

companies on the other hand offer fast responsiveness and flexibility. Combining the strengths of the players may lead to the most successful solutions.

Implications in the consumers perspective

The next perspective includes issues that deal with consumers of mobile payment systems. An important (grounded extensively in the data) condition for success has proven to be fulfilling consumers' requirements. Such consumer adoption factors do not seem to be well understood by providers of current mobile payment systems.

M-payment providers need to also better understand the importance of relating their services to existing payment procedures, and offering more benefits compared to such procedures. All the consumers' adoption factors need to be fulfilled in comparison to existing procedures. This study has identified specific findings about each of the adoption factors, and such findings are discussed next.

"Ability to try" is one of the requirements that providers seem to overlook. Trial periods, or other ways that would allow people to try such systems before committing to them could improve adoption and diffusion of mobile payments.

Consumers have security concerns regarding mobile payments. Such concerns mainly revolve around the issues of lost or stolen phones, fear of hacking attacks, and the lack of reliability of the transaction. Mobile payment systems should provide:

- an easy way of reporting theft/misplacement of the phone;
- the possibility of setting transaction limits;

- a clear statement on a lack of the consumer's liability for unauthorised transactions made by criminals;
- a way of accessing transactions history online to verify the purchases;
- passwords or PINs are a minimum level of protection of identity threat, but consumers seem to want to have more levels of protection;
- when the phone is stolen or lost, the funds on the account must be able to be recovered;
- security must be made explicit so that people carrying mobile phones with payment systems do not become a target for criminals.

Providers must not only offer secure systems, but also convince consumers about it. This issue will be a major challenge for providers since consumers will be hard to convince. They may have even higher expectations towards new mobile payment systems than to their existing payment procedures, possibly assuming that there are more threats available in wireless networks. Consumers' confidence and trust may be improved by the use of trusted brands (which is what banks especially can offer in mobile payment implementations). Another important implication is the necessity of clear and honest communication of the security of the new systems.

Users would only accept very low (or no cost) associated with mobile payments. They do not want to purchase a new phone, and they expect minimal transaction fees, especially for low-value items. Low cost will not be seen just as an advantage over existing methods of payments – rather, it is the only way that consumers would use such systems at all.

Users seem to have high expectations towards ease of use of mobile payments, especially because they find their current ways or payments very easy to use.

Potential users now seem to think that current m-payment solutions are too complicated. The systems must be made easier to use, understand and learn for an average user, not just for those who are technologically savvy. Limitations of phones' keypads must be considered a serious challenge, and efforts should be undertaken to minimize the number of clicks during mobile payment procedures.

Providers need to take reasonable effort to demonstrate that the customers' information is private. One way to increase privacy could be providing an option of not storing a record of a payment that a user does not want others to know about.

A huge challenge for providers is also to ensure ubiquity, or in other words, wide availability of mobile payments, which is a difficult challenge since cards and cash are accepted almost anywhere, and mobile payment systems providers must aim for the same level of access.

Consumers also require international interoperability of mobile payments, or, in other words, the ability to use mobile payment systems across the borders, or while travelling to other countries. It is important since consumers seem to have international interoperability expectations and experience with both mobile phones and payment cards.

Users also expect that the m-payment procedures will be standardized no matter where they are and what phone they use. They seem to have a high expectation of this feature based on their experience with other methods of payments, especially bank and credit cards. This could be a challenge for providers because of heterogeneity of mobile devices.

Potential users already see mobile payments as convenient. This is mainly because they would not have to carry many coins, cards, or devices on them. Cash was seen as an especially inconvenient payment method. Mobile payment systems may offer an attractive alternative to cash since users do not seem to mind carrying their phones around, and having payment systems in their phones would not require any extra space and weight. It would also be more convenient and free them of worries such as looking for change, having enough change, and others. Credit and debit cards however already offer these advantages; mobile payments that require no signing could still compete on the convenience factor. The findings also indicate that industry stakeholders do not appreciate the importance of convenience factors in successful implementations of mobile payment systems.

Mobile payments are seen as fast by potential users. Consumers do have complaints about the speed of their current payment methods (for example, because of signing, entering PINs, or counting out change), and therefore, they should be made very aware of the speed advantage of mobile transactions.

It is also essential that mobile payment systems give the consumers an opportunity to view their purchases history for a specified period of time since users appreciate this feature a lot in card payments. Mobile payments could provide an important advantage over existing payment methods since the purchases and balances could be looked up anytime, anywhere, thanks to mobile connection technologies and the phone's display unit. It would also be necessary to provide full statements online.

The users need to feel that a new payment method gives them control over their spending since otherwise they will not like it. Having a clear and immediate

access to their available balance, but also planning or daily limit options could make a mobile payment system an attractive payment alternative to consumers. It was suggested that current providers do not appreciate the importance of both the purchase tracking and spending control requirements of the users.

Consumers also want to have flexibility in their purchases, and be able to pay whenever the need arises, without earlier planning. A mobile payment system should provide a way for consumers to charge their accounts whenever they want, without the need to look for a machine to charge it. Mobile phones' connection possibilities could be used for such charging procedures.

Rewards programs could be the decisive factor for some users making them choose a specific payment method. New mobile payment systems could offer similar rewards programs that card programs do to attract consumers. Mobile payment providers could target younger people by offering easier to achieve rewards such as movie tickets or shopping vouchers, instead of airline tickets.

Providers also need to understand that only critical mass of users will make the mobile payment system viable. The relationship between consumers' demand and merchants' demand needs to be understood too.

Another important success factor includes the necessary condition of educating the consumers on the abovementioned benefits of mobile payment systems, and increasing their understanding of how mobile payments work. This may involve providing clear information about mobile payments, including success stories.

Implications in the merchants perspective

Merchants are also users of m-payments as they need to adopt the new payment system to provide it to their customers. An important implication of this study is that providers need to fulfil not only consumers' requirements, but also the necessary features that will make merchants more likely to accept and use the new procedure. This category has as its properties those specific features that merchants require to adopt mobile payments: security, low cost, and high number of users. A new m-payment system could not require any higher fees that those of existing payment methods. All the adoption factors will always be in comparison to existing procedures that merchants use to accept payments. Another condition is education about the benefits since merchants need to understand what mobile payment systems can offer to them. Merchants in this study seemed not to understand how such systems could help them but, when offered explanations that pointed out the benefits of such systems, they could see the worth of mobile payments.

Implications in the technology perspective

Technology is another perspective that includes some contexts and conditions that providers need to accommodate in their new mobile payment offerings.

Providers need to understand and take into account the currently available features of mobile devices, to make the best use of them in new mobile payment systems. When more advanced smartphones become more widespread, providers need to consider how to best use the new features such phones will offer. Providers also need to have an excellent understanding of available technologies, and use them properly in mobile payment implementations. These include network technologies such as mobile telecommunications networks, including 3G ones, but also WiFi and short range technologies such as Bluetooth, RFID, NFC

and others. To sum up, it is suggested that providers need to understand how to best use a) the available features of mobile devices, b) available network connection technologies, and c) other technologies that will include, for example, new security technologies or protocols. It is important to understand the available features and technologies, and it is possible to build successful solutions using existing technologies. Providers need to understand the suitability of such technologies, and use them properly.

In addition, there are a number of specific technical problems that need to be solved by providers too, such as setting up standard payment gateways, or handling registration of users.

Implications in the society perspective

Providers need to accommodate all the consumers' conditions, as discussed earlier, but they also need to consider the specific Society's perspective in the relevant market in which they operate to possibly include some additional features in their systems. Providers need to consider and accommodate various cultural influences in the society where they want to introduce their mobile payment systems. Adoption and diffusion of mobile payment systems in a given country will clearly depend on the number of users of mobile phones and their attitudes towards using their phones. Both of these categories are contexts that providers are not able to directly influence, but that they need to understand and account for in their systems.

Implications in the authorities perspective

The Authorities perspective deals with various laws and regulations with which providers need to comply regarding their mobile payment offerings. Providers need to gain an excellent understanding of laws and regulations that may affect

their mobile payment services. Taxation regulations also need to be carefully considered by mobile payment providers in light of new issues that may be brought about by mobile transactions. These two are important contexts, and although they cannot be directly influenced, they need to be well understood and accommodated by providers of mobile payment systems.

9.3 Research Limitations and Future Directions

The main limitation of this research is that while it aims to be as generic and universally applicable as possible, some of the proposed theory's factors are specific to the locale where a mobile payment system will be offered, and therefore cannot be predicted in detail. Especially, issues in the Authorities and Society perspectives could be studied separately for specific countries. This could be a direction for further studies that could focus on specific locations and cultural influences or legal regulations affecting mobile payments in various countries.

As revealed in Chapter 8, differences in terms of various subgroups of users finding some features more important have not emerged in this study. Such differences seem to be not significant enough to emerge from a qualitative study such as this one. It might be possible to detect some variations using a detailed quantitative study that would statistically compare the responses of hundreds of users, from a statistically representative sample. This can be, therefore, suggested as a future research direction to further supplement the current study. Such research could use all the consumers' adoption factors identified in this project, and in a large quantitative study across nations, age groups, and occupations, compare the results for the various groups.

Further specific recommendations within the various factors could be discovered in future studies, and hopefully this framework would provide guidance for other researchers both in terms of which specific categories are important to study, and also on the processes that may be employed.

9.4 Strengths of this Research

Significance

The research questions in this study were based on the identified research gaps, as revealed in Chapter 1. Mobile payments, despite their potential, have failed to reach expected adoption levels. It was shown that previous research focused on few specific topics only, mainly technology and consumers, both when this study was started and at the end of this project. A holistic framework addressing the limitations was missing, hence the significance of this study.

Sound and relevant theoretical background

The theoretical background of this study was considered not in an abstract way, but rather to offer direct implications for this research, as revealed in Chapter 2. The guiding epistemology, constructionism, holds that meaning is not discovered, but rather constructed by human beings as they engage with the world. Mobile payment systems in this research, therefore, were not studied in isolation, but through the conscious beings engaging with them – users, providers, and other stakeholders. Constructionism additionally posits that no subject's experience can be described in isolation from its object, and therefore, the meanings studied in this project were generated from the subjects' use of mobile payment systems or traditional payment procedures.

The interpretivist approach adopted in this study meant that the researcher was not looking for objective numerical data about mobile payment systems, but rather for meanings that people assign to the phenomena studied, the influence of context on mobile payment systems, and the full complexity of the situation.

The specific theoretical perspective that guided this study, symbolic interactionism, dictated the focus on social interactions which allowed the researcher to become aware of the others' perceptions, attitudes, and values, and interpret such meanings.

The theory grounded in empirical reality

The accuracy and the relevance of the theory proposed in this study are confirmed by the methodology employed in this research, grounded theory, as revealed in Chapter 2 of this thesis. Grounded theory discovers what actually is, not what should be. It is grounded in empirical reality, and shows what is really going on *in* the real world. There is focus on practice, and what is practical. It offers relevant answers to problems, not just abstract concepts. It provides answers that actually work. Grounded theory, such as the one proposed in this study, is relevant to what is going in the field. During the data analysis, the researcher tried to stay free from any claims she knew from literature. The theory came from the data, instead of being imposed on the data. When coding, the researcher distanced herself as much as possible from speculations offered by others.

Rigour and quality of the research

This quality and rigour of this research were assured by a careful application of the grounded theory methodology and specific quality procedures. Grounded theory is a recognized and rigorous methodology that provides a series of

systematic and exact methods for every stage of the research process. The testing and verification are conducted as an integral part of the development of the theory. Grounded theory guarantees accuracy of the results through its constant comparison method.

This thesis devoted the whole of Chapter 3 to the quality-ensuring procedures employed in this research. Numerous techniques were used to ensure quality of this research. For example, the actual words of the participants have been used to name categories and properties, instead of traditional terms used in well-known models, which helped to generate a true and accurate theory. Chapters 4 and 5 clearly explained the details of the data collection and analysis processes in this study so that quality of this research could be established. To better communicate the data collection and analysis processes, detailed explanations were provided, illustrated with figures and screenshots and numerous examples (such as changes in category names, spans, or relations).

When the theory was presented in Chapter 6, numerous quotes from the participants were used, not only to provide rich illustrations of the topic, but also to validate the conclusions and demonstrate to the reader how the researcher generated the theory.

Other payments' perspective

One of the challenges concerning mobile payment research is that because there are so few existing systems, most studies need to involve potential users that have no first-hand experience with mobile payments. In addition, mobile payments are often studied in isolation, outside of the context of existing payment procedures that customers use. To overcome both of these limitations, this study gave much attention to the users' experience with their existing

methods of payments, as illustrated in Chapter 4. Such approach proved to be very useful and provided important insights. This has also led to the discovery of some important success factors that have been overlooked in other studies, such as ability to track purchases, or the importance of rewards programs. Such influential factors could go unnoticed if experience with existing payment methods had not been studied.

Direct implications for providers

The theory presented in Chapter 6 includes both general factors that providers need to appreciate, and specific recommendations within each of them. Previous studies often provided names of factors only. In this theory specific guidelines can be immediately used by providers to improve their existing systems or better design their new implementations. What is more, the names of factors came from the participants' data, and therefore, are communicable and can be easily understood by providers. Some previous studies, on the other hand, used names that are not self-explanatory, such as "perceived behavioural control", for example.

Impact value of this study

For the duration of this research, there has been strong interest from the stakeholders when they were contacted for research purposes, which suggests that the results of the studies are important to them. Industry stakeholders have often stayed in contact, and many have asked to receive the conclusions of this study when it is published. Successful mobile payment systems can provide new forms of revenue to banks, mobile operators, and independent providers, and provide everyone a better way to pay.

The researcher has also published many papers about mobile payments at peer-reviewed conferences and journals. She has been working on some projects with three other mobile payment researchers from different countries.

The impact of this research is also confirmed by numerous requests from researchers from around the world sent to the author of this thesis asking for her publications.

Holistic and multi-perspective research and theory

This study revealed a multitude of influential factors for mobile payments. It proposed a holistic theory that emerged from studying numerous and varied stakeholders, and numerous and varied perspectives, as revealed in Chapter 4 (Data Collection Principles and Procedures).

The opinions of users, representatives of mobile operators, independent companies, banks, and others were taken into account. A variety of data collection methods were used, from wide-reach Web surveys to more focused face-to-face interviews. Interviewing managed to obtain detailed, in-depth information from subjects who know a great deal about their personal perceptions of events. Web surveys were used to reach as many participants with a variety of perspectives and generate as many initial categories as possible; in-person interviews were used to provide more depth and richness of data. Data collection stopped only when all the emergent categories were saturated. The study included participants from various countries, age groups, genders, and occupations to gain a variety of perspectives. In addition, theoretical sampling ensured that new and emerging concepts could be studied that might not have been taken into account at the beginning of the study.

To refine and saturate the theory even more, numerous existing studies were reviewed and analysed in Chapter 7, and the constructs proposed in the literature were instantly compared to the emerging theory, in some cases refining it further in Chapter 8.

All of the above provided an important advantage over previous mobile payment studies that often offered fragmented solutions, missing influences that have emerged in the current project. Some of the factors discovered in this project have not been proposed in the literature, as revealed in Chapter 8, which confirms the contribution of this study. The earlier studies often did not discuss relationships between the factors either. This research resulted in a truly holistic theory explaining the multitude of factors influencing adoption and diffusion of mobile payments.

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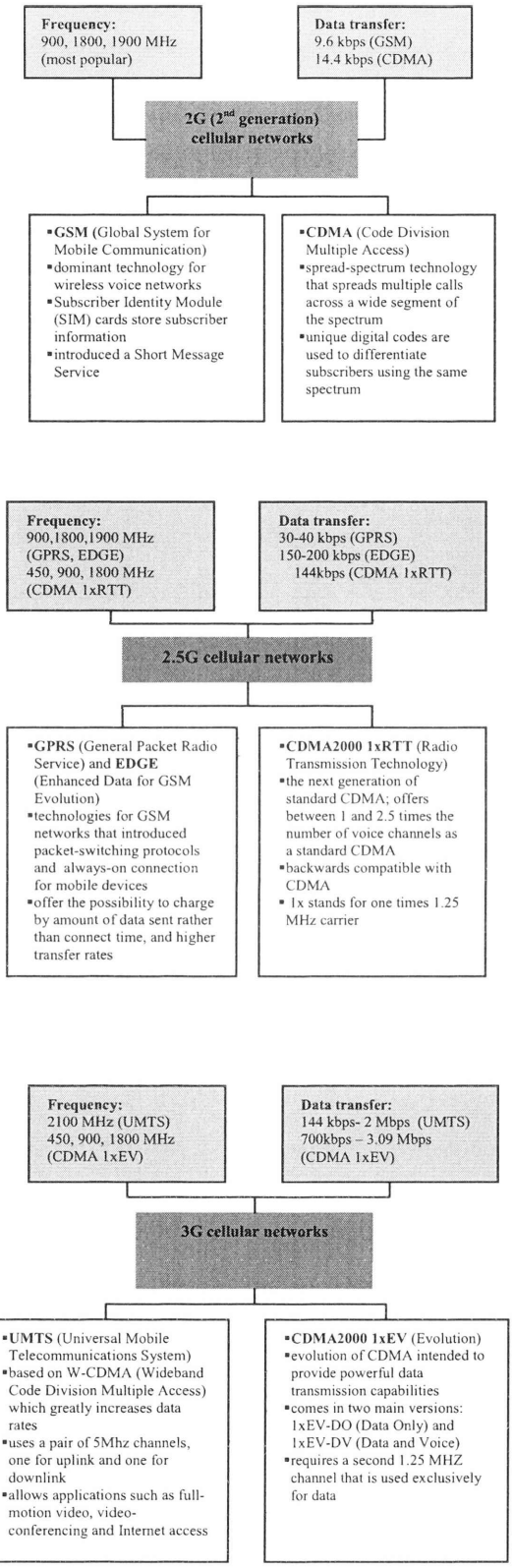
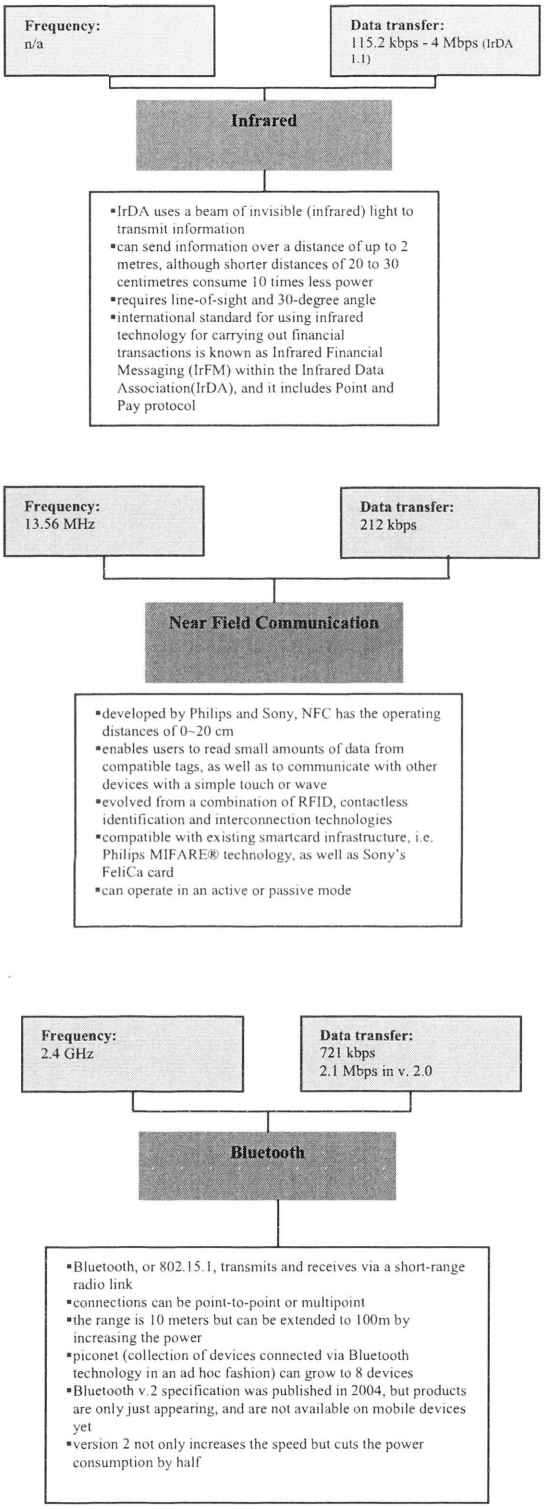
Appendix A

This appendix includes details about the technologies used in mobile payment systems. Most of them are referred to in the Introduction (Chapter 1) in Tables 2 and 3 that summarise possible mobile payment solutions. The technologies are presented here to provide background on how mobile payment systems can be built. The information was collated mostly from official consortia websites, listed at the end of this section. Various 2G, 2.5G, and 3G technologies are grouped together (e.g. GSM and CDMA) since when they share similar capabilities, their use in mobile payments will be the same. ZigBee has not found use in mobile payments since it is used in control and sensory network applications. WiFi (802.11) is used almost exclusively to link portable computers to the Internet, and since there does not seem to be justification for its use in mobile payments, there have been no systems deployed based on this technology. The first figures present all the connection technologies that may be important for mobile payment systems providers, and this is followed by a table with some other technologies.


Frequency:
900, 1800, 1900 MHz
(most popular)
Data transfer:
9.6 kbps (GSM)
14.4 kbps (CDMA)
2G (2nd generation) cellular networks
▪GSM (Global System for Mobile Communication)
▪dominant technology for wireless voice networks
▪Subscriber Identity Module (SIM) cards store subscriber information
▪introduced a Short Message Service
▪CDMA (Code Division Multiple Access)
▪spread-spectrum technology that spreads multiple calls across a wide segment of the spectrum
▪unique digital codes are used to differentiate subscribers using the same spectrum
Frequency:
900,1800,1900 MHz
(GPRS, EDGE)
450, 900, 1800 MHz
(CDMA 1xRTT)
Data transfer:
30-40 kbps (GPRS)
150-200 kbps (EDGE)
144kbps (CDMA 1xRTT)
2.5G cellular networks
▪GPRS (General Packet Radio Service) and EDGE (Enhanced Data for GSM Evolution)
▪technologies for GSM networks that introduced packet-switching protocols and always-on connection for mobile devices
▪offer the possibility to charge by amount of data sent rather than connect time, and higher transfer rates
▪CDMA2000 1xRTT (Radio Transmission Technology)
▪the next generation of standard CDMA; offers between 1 and 2.5 times the number of voice channels as a standard CDMA
▪backwards compatible with CDMA
▪ 1x stands for one times 1.25 MHz carrier
Frequency:
2100 MHz (UMTS)
450, 900, 1800 MHz
(CDMA 1xEV)
Data transfer:
144 kbps- 2 Mbps (UMTS)
700kbps – 3.09 Mbps
(CDMA 1xEV)
3G cellular networks
▪UMTS (Universal Mobile Telecommunications System)
▪based on W-CDMA (Wideband Code Division Multiple Access) which greatly increases data rates
▪uses a pair of 5Mhz channels, one for uplink and one for downlink
▪allows applications such as full-motion video, video-conferencing and Internet access
▪CDMA2000 1xEV (Evolution)
▪evolution of CDMA intended to provide powerful data transmission capabilities
▪comes in two main versions: 1xEV-DO (Data Only) and 1xEV-DV (Data and Voice)
▪requires a second 1.25 MHZ channel that is used exclusively for data


Frequency:
n/a
Data transfer:
115.2 kbps - 4 Mbps (IrDA 1.1)
Infrared
▪IrDA uses a beam of invisible (infrared) light to transmit information
▪can send information over a distance of up to 2 metres, although shorter distances of 20 to 30 centimetres consume 10 times less power
▪requires line-of-sight and 30-degree angle
▪international standard for using infrared technology for carrying out financial transactions is known as Infrared Financial Messaging (IrFM) within the Infrared Data Association(IrDA), and it includes Point and Pay protocol
Frequency:
13.56 MHz
Data transfer:
212 kbps
Near Field Communication
▪developed by Philips and Sony, NFC has the operating distances of 0~20 cm
▪enables users to read small amounts of data from compatible tags, as well as to communicate with other devices with a simple touch or wave
▪evolved from a combination of RFID, contactless identification and interconnection technologies
▪compatible with existing smartcard infrastructure, i.e. Philips MIFARE® technology, as well as Sony's FeliCa card
▪can operate in an active or passive mode
Frequency:
2.4 GHz
Data transfer:
721 kbps
2.1 Mbps in v. 2.0
Bluetooth
▪Bluetooth, or 802.15.1, transmits and receives via a short-range radio link
▪connections can be point-to-point or multipoint
▪the range is 10 meters but can be extended to 100m by increasing the power
▪piconet (collection of devices connected via Bluetooth technology in an ad hoc fashion) can grow to 8 devices
▪Bluetooth v.2 specification was published in 2004, but products are only just appearing, and are not available on mobile devices yet
▪version 2 not only increases the speed but cuts the power consumption by half

	Description	Notes
WAP 2.0	Wireless Application Protocol; a set of communication protocol standards to make accessing online services from a mobile phone simple; in 2.0 no WAP gateway necessary	delivers m-commerce sites to users, overcoming mobile device constraints, such as small display, low bandwidth, reduced memory; in GSM too long connection times, and slow downloads led to user disappointment
i-mode	proprietary mobile Internet service, packet-based	doesn't rely on a specific technology, can work on 2G, 2.5G, and 3G networks, but new handsets required; charges are based on the volume of data transmitted, not the amount of time spent connected; always on; however, only available to NTT DoCoMo customers
WAP push	provides a standard means to send data to a mobile subscriber without an explicit request from the subscriber at the time the data is delivered	can increase user-friendliness of mobile commerce since fewer clicks required
SMS	Short Message Service; available on digital GSM networks allowing text messages of up to 160 characters to be sent and received via the network operator's message centre to the mobile phone, or from the Internet:	can be used to send payment information to and from the user; almost all mobile phones support it; picture message can be used to send ticket barcode; can impose security threats
USSD	Unstructured Supplementary Service Data, messaging service but with no store-and-forward capability that is typical of 'normal' short messages; faster response time than SMS	can be used to send payment information to and from the user; almost all mobile phones support it

MMS	Multimedia Messaging Service, a system application by which a WAP client is able to provide a messaging operation with a variety of media types	allows to deliver rich billable multimedia content to the user
SAT	SIM Application Toolkit, a set of commands in the SIM card that can initiate them independently of the handset and the network	enables authentication, use of keys, digital signatures, and encryption of messages

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Appendix B

This appendix presents publications that have been published during the course of this research. The following table lists the various papers by the author of this thesis, and explains how each of them is relevant to this thesis.

Publication title and conference/journal details	Comments
Mobile Payment Publications	
Dahlberg, T., Mallat, N., Ondrus, J. & **Zmijewska, A.** (2007) Mobile Payments: A Review of Past, Present, and Future Research. Accepted to the ECRA (Electronic Commerce Research and Applications) Journal's Special Issue on Mobile Payments	The author of this thesis conducted an extensive literature review with three other researchers who have worked for several years in the mobile payment field. Mobile payment literature was classified according to the framework proposed by Dahlberg and Mallat (2002).
Dahlberg, T., Mallat, N., Ondrus, J. & **Zmijewska, A.** (2006) Mobile Payment Services Market Research – Past, Present and Future. Proceedings of the Mobility Roundtable, Helsinki	This paper formed the basis of the journal literature review described above. It included more general overviews of mobile payment topics, without discussing specific findings that have been included in the journal version.
Zmijewska, A. & Lawrence, E. (2006) Implementation Models in Mobile Payments. Proceedings of The IASTED International Conference on Advances in Computer Science and Technology (ACST), Puerto Vallarta	This publication dealt with one of the many issues identified in this research, namely the requirement of collaboration between mobile operators, banks, and independent providers.

Zmijewska, A. & Lawrence, E. (2005) Reshaping the Framework for Analysing Success of Mobile Payment Solutions. Proceedings of the IADIS International Conference on E-Commerce, Porto	This paper reported on the first findings of this study when juts the general perspectives started to emerge. It highlighted the importance of studying the multitude of perspectives in mobile payment adoption and diffusion studies.
Zmijewska, A. (2005) Evaluating Wireless Technologies in Mobile Payments - A Customer-Centric Approach. Proceedings of The Fourth International Conference on Mobile Business (ICMB), Sydney	The author evaluated various technologies that may be used in mobile payment systems, and their suitability for such systems. The evaluation however was based on the adoption factors identified from the existing research of which usefulness and expressiveness were later not confirmed in the empirical data of this study.
Pradhan, S., Lawrence, E. & **Zmijewska, A.** (2005) Bluetooth as an Enabling Technology in Mobile Transactions. Proceedings of the International Conference on Information Technology (ICIT), Las Vegas	This paper investigated the case studies of companies using one possible connection technology, Bluetooth, in mobile payment systems.
Lawrence, E., **Zmijewska, A.** & Pradhan, S. (2005) Mobile Payments: Partner or Perish? Proceedings of The Asian Applied Computing Conference (AACC), Kathmandu	The issue of collaboration was the focus of this paper, based on several case studies of companies that have had experience with partnerships.
Zmijewska, A., Lawrence, E. & Steele, R. (2004) Towards a Successful Global Payment System in Mobile Commerce. Proceedings of the IADIS International Conference on E-Commerce, Lisbon	This paper was a case study of Simpay, the first mobile payment system that was to be interoperable between various European countries. It evaluated the system before its actual launch, based on the information provided by its creators.
Zmijewska, A., Lawrence, E. & Steele, R. (2004) Towards Understanding of Factors Influencing User Acceptance of Mobile Payment Systems. Proceedings of the IADIS International Conference on WWW/Internet, Madrid	This paper proposed to study mobile payment adoption through an extension of Technology Acceptance Model (Davis, 1989) in a quantitative study. This approach was later abandoned, and the Theoretical Background and Methodology chapter of this thesis (Chapter 2) presents the rationale for the choice of the qualitative approach.
Zmijewska, A., Lawrence, E. & Steele, R. (2004) Classifying M-payments - a User-Centric Model. Proceedings of The Third International Conference on Mobile Business (ICMB), New York	This was the first attempt to review what possible mobile payment solutions exist, and classify them according to the characteristics that matter to the users.

Related publications

Zmijewska, A. & Lawrence. E. (2006) Mobile Technology Adoption – A Case Study. Journal of WSEAS Transactions on Information Science and Applications. Issue 1, Volume 3, January 2006, pp 96 - 104 (ISSN: 1790-0832)	This case study was based on interviews conducted in a restaurant using mobile devices for order taking. Although not directly on mobile payments, it provided useful insights about mobile technology adoption in general.
Zmijewska, A. & Lawrence. E. (2005) Traditional Acceptance Theories & Mobile Technology Adoption – A Case Study. Proceedings of the 4th WSEAS International Conference on E-Activities, Miami *** **Best Student Paper Award**	This conference paper was the basis of the extended journal version mentioned above. This version presented more general findings, and did not include details on methodology of the study.
Lubrin, E., Lawrence, E. & **Zmijewska, A.** (2006) Exploring the Benefits of Using Motes to Monitor Health: An Acceptance Survey. Proceedings of The First International Conference on Mobile Communications and Learning, Mauritius	These papers dealt with other wireless technologies than mobile payments, but again, they provided the researcher with insights and experience concerning adoption of various mobile technologies. Such applications included motes sensor networks, mobile government, mobile enterprise, and mobile learning systems.
Lubrin, E., Lawrence, E., Felix-Navarro, K. & **Zmijewska, A.** (2006) Awareness of Wireless Sensor Network Potential in Healthcare Industry: A Second UTAUT Study. Proceedings of the IASTED International Conference on Wireless Sensor Networks, Banff	
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Lawrence, E., Lawrence, J. & **Zmijewska, A.** (2005) Legal Remedies for Securing the Mobile Enterprise. IADIS International Journal on WWW/Internet , Vol.3 Issue 1 (ISSN: 1645-7641)	
Al-khamayseh, S., **Zmijewska, A.**, Lawrence, E. & Culijak, G. Mobile Learning Systems for Digital Natives. To appear in the Proceedings of The 6th IASTED International Conference on Web-Based Education, March 2007, Chamonix	

Other publications

Bachfischer, G., Robertson, T. & **Zmijewska, A.** (2007) Understanding Influences on the Typographic Quality of Text. To appear in the Journal of Internet Commerce

Bachfischer, G., Robertson, T. & **Zmijewska, A.** (2006) A Moving Type Framework. Proceedings of the WSEAS International Conference on Communications, Athens

Bachfischer, G., Robertson, T. & **Zmijewska, A.** (2006) Typography in Motion: Framework of Moving Type Use. To appear in Journal of WSEAS Transactions on Information Science and Applications, Issue 10, Volume 3, October 2006, pp 1810 - 1817 (ISSN: 1709-0832)

Bachfischer, G., Robertson, T. & **Zmijewska, A.** (2006) A Framework Towards Understanding Influences on the Typographic Quality of Text. Proceedings of the IADIS International Conference on E-Society, Dublin

These publications were not related to mobile payments directly, but referred to text design issues.