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Consumer Willingness to Use and Pay for Mobile Payment Services

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Abstract. This study applies the Technology Acceptance Model to examine factors such as perceived usefulness and perceived ease of use on consumer willingness to use mobile payment services. This study also includes exploratory research on external factors – convenience, security, new technology – that affect mobile payment acceptance and use. Thirdly, consumer price sensitivity to various levels of service fees is assessed.

The results show that although awareness of mobile payment services is reasonably high, only a small number of New Zealand consumers actually use m-payments. However, consumers acknowledge that mobile payment services can be useful, easy to use, and convenient. Consumers are generally unwilling to pay service fees except for time-sensitive events – reserve a seat at a concert tonight – or when no alternative payment method exists – at a parking meter with no coins. Security, especially confidentiality of mobile payments, is also a concern.

Keywords*: mobile payments, mobile business, mobile commerce; e-payments; economic studies*

1 Introduction

The ubiquitous mobile telephone has evolved from a simple communications tool to a multi-functional computing device. In addition to voice calls, modern mobile telephones also include text capability, cameras, contacts lists, calendars, e-mail access, Web browsing, and much more. This increased functionality has made the mobile phone as common and intimate as, well, a wallet, purse, keys or money [19]. Increasingly, individuals are adding payments for goods and services to the list of functions they expect from their mobile telephone.

Mobile payments are the newest form of electronic payments which, in the business-to-consumer mode of e-commerce, also includes EFTPOS (electronic fund transfer at point of sale), smart cards, credit card payments over the Internet, e-cash, and others. E-payment has been a popular payment method for consumers because it makes the need for cash on hand less crucial. Businesses benefit as well because funds can be transferred without having to handle or transport cash and coins. For

both consumers and businesses, transactions can be more easily tracked and monitored.

Several forms of mobile payments exist, but for the purposes of this study, a mobile payment is defined as the use of a mobile telephone and associated services, especially text messaging, to make a consumer retail purchase, what others have called cellular m-payment (e.g., [2], [6]). Excluded from this study are payments made with cards or tags used in close physical contact to a reader – for example proximity contact cards or RFID tags. Similarly, the use of a laptop computer to make an e-payment on wireless network is not included in this study's definition of m-payment. Finally, the use of a mobile phone for non-retail purchases (e.g., person-to-person mobile banking, bill payment by mobile phone) is not considered in the current study.

A truism in all economic markets is "you can't do business if you can't get paid". Electronic commerce has become successful because consumers are no longer concerned about the security of submitting their credit card on the Internet and the emergence of alternative Web-based payment systems such as PayPal. If mobile commerce is to be successful, processes for making payments on mobile phones and PDAs are going to have to become widely available and accepted.

The business value of mobile payments is especially strong for mobile network operators (MNOs). MNOs have made a large investment in the technical infrastructure that supports their networks and getting a satisfactory return on this investment is discussed in every MNO boardroom. The value proposition for mobile payments for MNOs is derived from both the ubiquitous nature of the mobile phone and the potential for micropayments. In the latter case, mobile telephone operators already have billing systems that track micropayments (e.g., a 20 cent text message) so mobile phones are especially well placed when billing small amounts (e.g., a parking meter, a vending machine) at low transaction costs [8]. MNOs may charge for this convenience by adding a service fee for each transaction. This increases ARPU (average revenue per user), a key measure of profitability in the mobile phone industry. MNOs are eager to increase ARPU in this way, especially since global mobile payment transactions are estimated to grow rapidly to be worth £20 billion (US$39 billion) by 2008 [17].

However, are consumers ready to embrace this new method of payment? Are consumers willing to pay associated service fees? What other barriers / incentives might reduce / increase uptake of mobile payments in the consumer market? This study addresses these questions in a small country context.

2 Purpose of the Study

The principal purpose of this study is to assess the willingness of consumers to use and pay for products and services using their mobile phone. The study begins by examining to what extent are New Zealand consumers aware of and already using mobile payments? The second research question applies the Technology Acceptance Model (TAM) to ask how do New Zealand consumers perceive the use of their mobile phone for payments and exploratory research on external factors why consumers do

and don't use mobile payments. The study concludes by asking consumers how much they are willing to pay for the ability to make m-payments.

3 Mobile Payment Services in New Zealand

Mobile payments are not science fiction. Several m-payment services already exist in New Zealand and these are briefly described in this section.

TXT-a-Park allows a consumer to use their mobile phone to pay for permission to park a vehicle in an on-street location for an allotted period of time (i.e., a parking meter payment). Briefly, a parking meter code and desired payment is texted to the parking authority and a parking receipt is printed for placement on the vehicle's dashboard. The payment and a 50-cent service fee is deducted from the prepaid balance or charged to the user's mobile phone account. Txt-a-Park is available in both Wellington and Auckland on both the Vodafone NZ and Telecom NZ networks.

HotLink™ is used to pay a Vodafone mobile phone bill or top up a prepay account from a bank account. Once registered, the consumer follows a series of menu choices and enters a PIN number to transfer money (minimum $20) from a bank account to their Vodafone account. Two-factor authentication is used at registration and all HotLink transactions are encrypted. There is no service fee for this service.

mTicket sells ticket to certain events over the Vodafone network. After initiating the purchase via a text message (e.g., "text this event number to 858") and confirming it with a "buy" text message, a reply text message contains a booking number that is shown at the venue to gain entry. The cost of the ticket and a $2-2.50 per ticket service fee is charged to the user's Vodafone account or prepay balance. (Note: most ticket sellers in NZ charge a similar service fee.)

Telecom Music Store / Vodafone Live! Music – both NZ mobile network operators sell ring tones ($2-7.00) and full song tracks (usually $3.50) to their customers with appropriate handsets (e.g., sufficient storage space for the song).

4 Technology Acceptance Model

The Technology Acceptance Model (see Figure 1) is a theoretical model that explains how users come to accept and use a technology [5]. TAM assumes that perceived usefulness ("the degree to which a person believes that using a particular system would enhance his or her job performance" ([4, p. 320]) and perceived ease of use ("the degree to which a person believes that using a particular system would be free of effort" [4, p. 320]), with the influence of pre-existing external variables (e.g., security concerns, convenience), are the primary determinants for adoption of a new technology [14]. Perceived ease of use has a direct effect on perceived usefulness and both determine the consumer's attitude toward use, which leads to behavioral intention to use the system and actual use of the system.

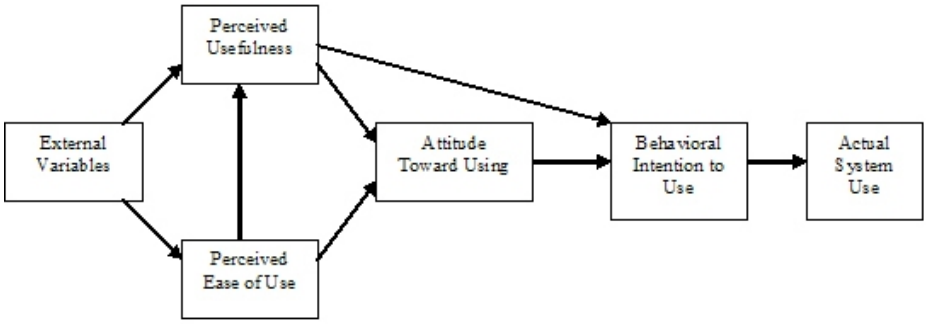

Fig. 1. Technology Acceptance Model

5 Consumer Acceptance of Mobile Payments

Mobile payments is emerging as a popular research topic. Previous studies have identified the following four issues of concern for consumer acceptance and adoption of mobile payments, and all four issues have relevance for the current study.

Security: By their nature, mobile payments involve the transfer of funds. Understandably, consumers want to insure that their financial account details are kept safe and so security is a principal consideration for adoption of m-payments. For example, the mobile payment survey (MP1) found 96% of respondents required confidentiality of data before they would use mobile payments [18]. Security is sometimes defined in the traditional way – authentication, confidentiality, data integrity, and non-repudiation (e.g., [1], [2], [6], [16]). Security has also been defined more broadly to include reliability, privacy, anonymity, trustworthiness, and consumer protection [7]. Most studies include security as one of several factors in consumer acceptance of mobile payments (e.g., [1], [2], [6], [7], [11], [15], [16], [18]) but it is also the principal focus of a few studies (e.g., [12], [13]).

Usability: Ease of use and usefulness of mobile payments are widely examined in the literature. Some studies (e.g., [2], [6], [21]) have applied the Technology Acceptance Model to examine perceived ease-of-use and usefulness. Other studies have examined usability as a critical success factor [1], a factor in complexity of use [15] or in a variety of other ways (e.g., [7], [15], [16], [20]).

Convenience: One positive factor in consumer acceptance is the anytime, anywhere nature of mobile payments. A number of studies have found convenience of payments is a factor in consumer acceptance and use of mobile payments (e.g., [2], [6], [11], [15], [18], [20]). A few studies have investigated more specific or related aspects of convenience such as speed of the transaction [2], availability for urgent payment requirements [15], and convenience of the transaction record appearing on the mobile phone bill ([18], [20]).

Cost: A major focus of this study is the additional cost incurred by mobile payments, often called a service fee or transaction fee. All definitions of cost include these service fees, but other cost-related items include set-up or registration fees ([1], [21]), annual subscription fees [1], and even the cost of the mobile phone itself ([18], [21]). Consumers are quite sensitive to these costs. For example, the mobile payment survey (MP1) found 92% required little or no costs to use mobile payments [18]. Studies that have specifically examined mobile service fees found "no direct transaction cost must be charged" [1, p. 97], for widespread adoption; m-payment methods are disadvantaged by service fees because credit card transactions on the Internet and physical cash methods incur no charges [7], and service fees are a significant consideration for many customers, "especially if paying for low cost soft drinks or parking" [21]. Other studies that included some aspect of cost in consumer acceptance and use include [7], [11], [15], and [9].

In addition to security, usability, convenience, and cost, other factors that have been found to affect consumer acceptance and use of mobile payments include comprehensiveness [1], interoperability [16], technical acceptability [1], and lack of critical mass [15].

6 Research Methodology

An electronic, self-administered questionnaire was used in this study. The survey method is appropriate for this study as it provides a quantitative description of attitudes, experiences and opinions of the sample population [3]. It is an efficient way of gathering data using a standard set of questions.

The target population was all mobile phone users in New Zealand. The Web-based survey was available during October and November 2006 and was widely advertised in the local student and academic community and at the popular Web site Textvouchers.com, which includes subscribers from throughout New Zealand.

7 Results

In the end, 132 usable responses were received and the demographic profile of the respondents is summarized as follows:

- Almost half (46%) of respondents were 21-30 years of age. Twenty-six percent were under 21 years of age and the rest (28%) were 31 or older.
- Forty-one percent of the respondents earned less than NZ$10,000 per year and another 29 percent earned NZ$10-25,000. Only 10% earned more than NZ$45,000.
- About 70% of respondents own only one mobile phone. Nearly 26% own two mobile phones and 4% own three or more mobile phones.
- Over 50% of participants have owned a mobile phone(s) for more than five years. Only 6% had been using a mobile for less than a year. Those who have

had a mobile phone from 1 – 2 years are 16% and those who have owned at least one from 3 – 5 years are 28%.

- Nearly 50% of respondents sent 21 or more text messages per week. An approximate same percentage (15-16%) sent 2 – 5, 6 – 20 or 11 – 20 text messages per week. Very few (4%) send one or zero messages per week.

Comparable data to the New Zealand population are not available, but there is nothing to suggest that this sample is not representative of the New Zealand population who owns a mobile phone. The most likely exception is the relatively low income level of the respondents (average New Zealand income is approximately NZ$37,000 per year).

7.1 Consumer use of mobile payment services

Table 1 shows how many respondents knew of the existence of current mobile payment services in New Zealand (column 2; table ranking) and the number of times they had used it (columns 3-6). The 55+ percent response for music purchases and Hotlink is not surprising given the widespread promotion of both services by both mobile operators. The Txt-a-Park figure is also relatively high, given that Txt-a-Park is only available in two city centers. Twelve percent of respondents have not heard of any m-payment services.

The "use" percentages in Table 1 include only those respondents who had knowledge of the payment service, so this analysis is know-of-and-used. Hotlink is the most widely used service (29% used it at least once), followed by phone-accessible music stores (25%), TXT-a-Park (21%), and mTicket (17%).

Table 1. Knowledge of and use of mobile payment services

	Know of…	Not used	Used: 1-2	Used: 3-4	Used: 5+
Music	59.8%	74.7%	8.9%	6.3%	10.1%
HotLink	55.3%	70.8%	9.7%	4.2%	15.3%
TXT-a-Park	51.5%	79.4%	10.3%	2.9%	7.4%
mTicket	13.6%	83.3%	11.1%	5.6%	0.0%
None at all	12.1%	--	--	--	--

7.2 Consumer attitudes toward using mobile payments

A key objective of this research was exploration of variables related to the Technology Acceptance Model that determine attitudes toward use – perceived usefulness, perceived ease of use, previously identified external factors such as security concerns and convenience, and exploratory research on other potential factors. In some cases, the results of this New Zealand-based study (NZ) are presented and discussed with results from a comparative study [6] in the United States (US).

Most NZ respondents (59%) perceive mobile payments to be useful or very useful, similar to US consumers (61%), as shown in Table 2. A small proportion of New Zealanders (8% versus 14% in US) consider mobile payments "not useful". Almost one-third of the NZ population (32%) and one-quarter of the US population (24%) are neutral.

Table 2. Comparison of perception of mobile payments

Perceived usefulness	Not useful at all	Not useful	Neutral	Useful	Very useful
New Zealand	1.7%	6.8%	32.2%	35.6%	23.7%
United States	2.0%	12.3%	24.3%	51.2%	10.3%
Perceived ease of use	**Not easy to use at all**	**Not easy to use**	**Neutral**	**Easy to use**	**Very easy to use**
New Zealand	0.8%	6.7%	36.1%	41.2%	15.1%
United States	2.0%	4.7%	15.2%	62.5%	15.5%
Convenience	**Will not improve at all**	**Will not improve**	**Neutral**	**Will improve**	**Will definitely improve**
New Zealand	1.7%	6.7%	44.5%	35.3%	11.8%
United States	1.8%	14.4%	29.9%	45.2%	8.7%

A similar pattern is evident in the perceived ease of use – a large majority in both countries (56% in NZ and 78% in US) considers mobile payments easy or very easy to use and only a small percentage (approximately 7%) in both countries rate mobile payments as low in perceived ease of use.

One external factor measured in both studies is will mobile payments improve convenience in paying for goods and services. While a majority of Americans think so (54%), slightly fewer New Zealanders (47%) recognize convenience as an important factor.

Perhaps the most significant external factor that determines attitude toward use is security (e.g., [12], [18]), and so security was explored in considerable depth in both studies. Specifically, four aspects of security – authentication, confidentiality, non-repudiation, and data integrity – were examined and results for both New Zealand (this study) and the United States [6] are presented in Table 3.

Table 3. Comparison of perception of mobile payment security

Authentication	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New	39.3%	34.2%	22.2%	2.6%	1.7%

Zealand					
United States	6.7%	29.0%	34.1%	24.1%	6.1%
Confidentiality	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	50.9%	28.4%	15.5%	3.5%	1.7%
United States	6.1%	21.2%	31.9%	34.0%	6.7%
Non-repudiation	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	25.9%	34.5%	31.0%	8.6%	0.0%
United States	3.1%	11.6%	33.6%	42.8%	8.9%
Data integrity	Very concerned	Concerned	Neutral	Not concerned	Not concerned at all
New Zealand	42.7%	29.1%	22.2%	5.1%	0.9%
United States	2.1%	7.0%	24.1%	56.7%	10.1%

The key observation from Table 3 is that on all four aspects, security of mobile payments is of considerably greater concern to New Zealanders than Americans. This difference is somewhat difficult to explain as New Zealanders have a reputation for being quite accepting and trusting of new technologies. Timing of the two studies may be an issue as the US study was completed in 2004 or earlier, before considerable media coverage about mobile security issues in 2006, the year in which the New Zealand population was surveyed. Whatever the explanation, mobile service operators, especially in New Zealand, will have to provide secure mechanisms for mobile payments and publicize them broadly to their customers.

For the first time in any study we are aware of, this study conducted exploratory research on the underlying reasons why consumers do or don't use mobile payments and the ranked results are shown in Tables 4 and 5.

Table 4. Reasons for using mobile payments

Reason	Percent
No coins available	59.6%
Convenience of buying goods and services	37.5%
Easier than cash	36.0%
Trying new technologies	31.6%
Novelty of using m-payments	28.7%
Easy to learn and simple to use	24.3%
Better quality obtained	17.6%

Not unexpectedly, convenience is a key reason why many consumers would chose to use mobile payments – convenience is included in some aspects of the top three reasons that consumers will use mobile payments. By far, the largest proportion (60%) use mobile phones for the most convenient reason of all – they have no other option. Other reasons, supported by anecdotal evidence, are that NZ consumers like to "give it a go" and try any new payment option at least once. However, mobile service operators need to realize that if the service does not live up to expectations, it is unlikely that the consumer will repeat the process, something that is essential to maintaining and growing ARPU.

Table 5. Reasons for not using mobile payments

Reason	Percent
Dislike paying for service fees	61.0%
Proper security is probably lacking	30.2%
Easier to pay with cash	30.2%
Service is easy to use, but registration is too troublesome	29.4%
Try new technology later	14.7%
Don't want to change how things are usually done	11.0%
Do not like sending text messages	5.2%
Do not know how to send text messages	2.9%
Can't be bothered trying new things	2.2%

Table 5 explores the reasons why people would not use mobile payments. A large majority (61%) of respondents are opposed to paying service fees (this will be explored in more depth in the next section). One explanation for this may be the relatively large percentage of low-income respondents in the study. In a study that included a more income-representative population, resistance to paying service fees may decrease. Approximately equal percentages (30%) cite security, the convenience of using cash, and burdensome registration processes as problems.

7.3 Consumer readiness to pay for mobile payment services

A key question for both the authors of this study and the mobile network operators who support these m-payment services is the willingness of the consumer to pay service fees usually associated with m-payments. Tables 6 and 7 show the maximum service fee respondents are willing to pay for selected goods and services.

Table 6. Maximum amount of service fee a consumer is willing to pay for a…

	NZ$4.00 parking display ticket	NZ$2.00 drink from a vending machine

No fee	41.2%	50.0%
20 cents	33.1%	28.7%
50 cents	12.5%	5.9%
70 cents	0.7%	0.0%
$1.00	12.5%	15.4%

Table 6 includes two small purchases – typical prices for one hour of parking (NZ$4) and a juice or soda drink (NZ$2). Currently in New Zealand, consumers pay a $0.50 fee for a parking ticket and mobile payments for vending machines are currently not offered.

For a $4.00 parking ticket, 13% of respondents would pay the current service fee of 50c and 33% would be willing to pay the lesser charge of 20c charge. The largest proportion (41%) would not pay any service fee. A similar pattern is evident for the $2 drink except that a surprising percentage (15%) is willing to pay a maximum of $1.00, which is fifty percent of the price of the drink. In economic terms, these individuals are quite price insensitive to the service fee and/or they may have visualized an urgent situation in which they are willing to pay a high service fee to be able to quench their thirst.

Table 7. Maximum amount of service fee a consumer is willing to pay for a…

	Utilities bill (water, electricity)	Concert ticket bought in advance	Concert ticket bought on the day of the event
No fee	41.9%	32.4%	27.2%
50 cents	27.9%	25.0%	14.0%
$1.00	10.3%	15.4%	18.4%
$1.50	2.9%	6.6%	3.7%
$2.00	8.1%	10.3%	13.2%
$2.50	0.0%	1.5%	2.2%
$3.00	8.8%	8.8%	21.3%

The products and services in Table 7 are substantially higher and more variable than in Table 6 – concert tickets can cost $30-150. Accordingly, a higher set of service fees has been applied (NZ consumers currently pay $2-2.50 to use Vodafone's mTicket service and all major ticket sellers charge a similar fee, usually $2). Table 7 also introduces the variable of time sensitivity in regard to the purchase of a concert ticket.

Consumers are quite price sensitive in regard to payment of utility bills – only 20% are willing to pay more than $1 – at least in part because there are a large variety of payment options, including automatic deduction from a bank account. A larger number of mobile phone owners (27%) are willing to pay more than $1 for a concert

ticket bought more than one day in advance and 40% are willing to more than $1 for a concert ticket purchased on the same day, so as to get one of the best remaining seats. As expected, consumers are time sensitive in their willingness to pay service fees for mobile payments.

8 Conclusions

Mobile payment services are not widely known and used even less in New Zealand. These findings provide empirical evidence to support observations made about lack of consumer uptake in Australia [20] and Europe [10]. Nevertheless, New Zealanders consider mobile payments to be useful, easy to use and convenient. However, NZ consumers are concerned about security, especially confidentiality, and that mirrors the results of many studies including [6] and [18]. No other study has considered a variety of external factors beyond convenience and security to explain why consumers use or don't use mobile payments (Tables 4 and 5). Further research to refine and better qualify these factors is needed.

Another contribution has been made to the literature by assessing consumer willingness to pay service fees when making a mobile payment. Specifically, consumers are quite price sensitive to making mobile payments when a service fee is charged, except when urgent (e.g., on the day of the concert, in Table 7) or there is no alternative (e.g., no coins available, in Table 4).

The findings of this study will be especially useful for mobile telephone operators interested in increasing ARPU through mobile payments and merchants who which to provide mobile payment systems to their customers.

References

1. Antovski, L., Gusev, M.: M-Payments. 25th International Conference on Information Technology Interfaces. (2003) 95-100
2. Chen, L.A.: Theoretical Model of Consumer Acceptance of mPayment. Proceedings of the Twelfth Americas Conference on Information Systems. (2006) 1978-1982
3. Creswell, J.W.: Research Design: Qualitative, Quantitative and Mixed Method Approaches. 2nd edn. Sage Publications Thousand Oaks, CA (2003)
4. Davis, F.D.: Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly. 13(3) (1989) 319
5. Davis, F.D.: User Acceptance of Information Technology: System Characteristics, User Perceptions, and Behavioral Impacts. International Journal of Man-Machine Studies. 38(3) 1993 475-487
6. Dewan, S., Chen, L.: Mobile Payment Adoption in the US: A Cross-Industry, Cross-Platform Solution. Journal of Information Privacy and Security. 1(2) (2005) 4-28
7. van der Heijden, H.: Factors Affecting the Successful Introduction of Mobile Payment Systems. Proceedings of 15th Bled Electronic Commerce Conference. (2002) 430-443
8. Hinds, D.: Micropayments: A Technology with a Promising but Uncertain Future. Communications of the ACM. 47(5) (2004) 44

9. van der Kar, E., van der Duin, P.: Dealing with Uncertainties in Building Scenarios for the Development of Mobile Services. Proceedings of the 37th Hawaii International Conference on System Sciences. (2004) 1-10
10. Karnouskos, S., Vilmos, A.: The European Perspective on Mobile Payments. IEEE Symposium on Trends in Communications (SympoTIC '04). (2004) 195-198
11. Kreyer, N., Pousttchi, K., Turowski, K.: Mobile Payment Procedures: Scope and Characteristics. e-Services Journal, 2(3) (2003) 7-22
12. Lee, C., Kou, W., Hu, W.: Mobile Commerce Security and Payment Methods. Advances in Security and Payment Methods for Mobile Commerce. Idea Group Publishing Hershey, PA (2005)
13. Linck, K., Pousttchi, K., Wiedemann, D.G.: Security Issues in Mobile Payment from the Customer Viewpoint. Proceedings of the 14th European Conference on Information Systems. Göteborg, Schweden (2006)
14. Lu, J., Yu, C-S., Liu, C., Yao, J.E.: Technology Acceptance Model for Wireless Internet. Internet Research. 13(3) (2003) 206-222
15. Mallata, N.: Exploring Consumer Adoption of Mobile Payments: A Qualitative Study. Journal of Strategic Information Systems. 16(4) (2007) 413-432
16. Mobile Payment Forum: Enabling Secure, Interoperable and User-Friendly Mobile Payments (2002)
17. New Media Age: M-payments Predicted to be Worth £20bn by 2008. New Media Age. 5 (2004) 11
18. Pousttchi, K., Zenker, M.: Current Mobile Payment Procedures on the German Market from the View of Consumer Requirements. DEXA Workshop on Mobile Commerce Technologies and Applications. Prague, Czech Republic (2003)
19. Srivastava, L.: Mobile Mania, Mobile Manners Thumb Culture: The Meaning of Mobile Phones for Society, Peter Glotz, Stefan, Bertschi, Chris Locke (eds.), Transaction Publishers New Brunswick, NJ. (2005) 199-210
20. Teo, E., Fraunholz, B., Unnithan, C.: Inhibitors and Facilitators for Mobile Payment Adoption in Australia: A Preliminary Study. Proceedings of the International Conference on Mobile Payments. (2005) 663-666
21. Zmijewska, A.: Evaluating Wireless Technologies in Mobile Payments: A Customer Centric Approach. Proceedings of the International Conference on Mobile Payments. (2005) 354-362