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# CONDITIONS FOR ACCEPTANCE AND USAGE OF MOBILE PAYMENT PROCEDURES

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## ABSTRACT

*Mobile payment (MP) is crucial for, but not limited to mobile commerce. The key to mobile payment acceptance is in the hands of customers. In this paper we examine the conditions for acceptance and actual usage of MP procedures by the customer. We identify essential conditions which belong to the categories costs, security and convenience. Different preferences lead to an individual set of essential conditions for any single user. We propose a scheme for their representation and comparison and, based on these results, examine the relevance of the different criteria with empirical results. Additionally, we propose an approach to a commensurate condition for the usage of MP procedures based on the theory of informational added values. Finally, applications and constrictions of the results are shown and an outlook on the future of mobile payment is given.*

## 1 INTRODUCTION

According to recent studies, mobile commerce (MC) revenues are expected to rise from approximately 3,4 billion US-\$ in 2002 up to 22,2 billion US-\$ worldwide in 2005, whereof 57% are in the business-to-consumer segment (Graumann/Köhne 2002). Skepticism may be advisable for any prediction of MC turnover figures as we saw many of them come and go in the last years, but the tendency still remains undoubted.

As was already observable in electronic commerce (EC), the potential of business models only based on sponsoring or advertisement is limited. In order to generate direct revenues from business-to-consumer (B2C) MC, adequate forms of payment are required. Whereas in B2C EC we still see the dominance of traditional payment systems such as cash on delivery or sale on account (cf. e.g. Stroborn 2002), a payment system for MC will be typically not adequate until it shares fundamental characteristics of the mobile offer it is to bill for, in particular its *ubiquity* (Pousttchi et al. 2003). From this postulation follows the necessity of mobile payment. As is shown later, MP is crucial for, but not limited to MC scenarios. On the contrary, usability of an MP procedure in scenarios others than MC is relevant for its acceptance.

We define *mobile payment (MP)* as that type of payment transaction processing in the course of which - within an electronic procedure - (at least) the payer employs mobile communication techniques in conjunction with mobile devices for initiation, authorization or realization of payment. For purposes of this paper, we refer to the term *payment systems* whenever we discuss a general payment method such as cash, electronic payment or MP. We refer to the term *payment procedures* whenever we talk about concrete solutions such as m-pay, Paypal or (the former) Paybox.

The examination of the evolution of payment systems shows that the key to acceptance is in the hands of customers. Two well-known examples are the spread of the US credit card system in Europe (although merchants were not enthusiastic about handing over 3 to 5 per cent of their revenue to credit card issuers) and the simple debit procedure in Germany (although banks tried hard to prevent this in favor of selling their point-of-sale terminals to merchants). These systems finally superseded the Eurocheque, which dominated the market for many years, because of the market power of customers who wanted to use them regardless of the preferences of banks or merchants.

Several studies show that a good many customers are in principle interested in and willing to use their mobile device for payment purposes, even outside of MC (e.g. Graumann/Köhne 2002 p. 380, Kreyer et al. 2002a, Speedfacts 2001). But still MP as an established payment system seems to be a distant prospect.

In this paper we examine the conditions for actual utilization of MP procedures by the customer. In order to understand what is necessary to turn a mobile phone user into an MP user, we have to differentiate the essential and commensurate conditions for this. Fulfilling all *essential conditions* causes a customer to accept an MP procedure as a usable method of payment in principle (and thus, at least, not to exclude its usage), while fulfilling one of the *commensurate conditions* could turn, then, this acceptance into actual usage. Each of these two represents a single step of change of the user's attitude towards MP.

As it is important for the understanding of the user's view, we begin with an identification of the relevant payment scenarios in section 2. Subsequently the different types of conditions are examined, firstly the essential conditions in section 3, secondly the commensurate conditions in section 4. In section 5 we draw conclusions for the development of MP procedures and the future market evolution.

The empirical statements on customer acceptance made in this paper refer to the German market as they are derived from the results of the mobile payment survey MP1 which was conducted by the University of Augsburg in October and November 2002. For more details on the methodology of MP1 see (Khodawandi et al. 2003).

## 2 PAYMENT SCENARIOS

We already claimed that MP is not limited to MC. Instead, a mobile payment transaction can take place in different general settings.

**Table 1: Relevant MP scenarios**

scenario	scenario description	competing payment systems
<i>MC scenario</i>	New applications and services, e.g. context-sensitive information or video/audio streaming on mobiles	---
<i>EC scenario</i>	All kinds of B2C EC excluding MC, e.g. purchase of goods or content via the Internet	offline payment debit-/credit card e-payment
<i>stationary merchant scenario</i> ( <i>person</i> ) ( <i>automat</i> )	"Bricks-and-mortar" commerce with transactions between a person (customer) and - a person (e.g. cashier, taxi driver) respectively - a vending machine (e.g. ticket, cigarettes)	cash debit-/credit card
<i>C2C scenario</i>	Money transfers between individuals, e.g. for settling an E-Bay transaction, as pocket-money for children, for settling debts for small amounts	(cash) (offline payment)

Brokat distinguished three "worlds" for the transactions and called these the "r-world", "e-world" and "m-world" (Kruppa 2001). We agree to this distinction with regard to the point of sale (or service), but differentiate them a little more precisely and add the idea of payments from one customer to another. This leads us to four general MP scenarios: the *mobile commerce scenario*, the *electronic commerce scenario*, the *stationary merchant scenario*, which can occur as stationary merchant scenario (*person*),

e.g. to pay in a department store, for a taxi or a pizza service, and stationary merchant scenario (*automat*), and the *customer-to-customer scenario*. We also note that in different settings MP competes with a variety of other payment systems, being the unique proposition only in MC (table 1). In scenarios others than MC, MP can be simply understood as an MC application to complete a payment.

As a matter of convenience (cf. section 3.1), it is important that a procedure is not limited to MC scenarios, but can be used in other settings, too. Briefly, it should be possible to use the procedure whenever, wherever and for whatever kind of payment the user wants.

Fig. 1 shows the acceptance of MP by customers in the different scenarios (Khodawandi et al. 2003).

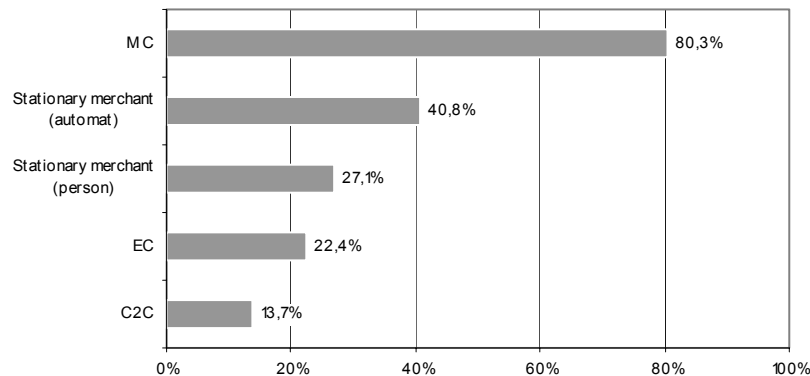


Fig. 1: Acceptance of MP in the payment scenarios

It is remarkable that users show a significant need for MP in the scenario stationary merchant (automat) while most of current MP transactions take place in the EC and C2C scenario and the latter two even show much more refusal than acceptance (EC 41,4% and C2C 67,6% refusal).

### 3 ESSENTIAL CONDITIONS

#### 3.1 Categories

The fulfillment of the essential conditions causes a mobile phone user to accept an MP procedure as a usable method of payment in principle. Thus, whereas fulfillment of the conditions does not yet mean actual usage, infringement of one single condition will prevent the customer from using the procedure.

In exceptional cases it can still be possible that he does anyhow because either he has no alternative or other facts outweigh the infringed condition. This may be the case if he needs imperatively or wants desperately to use an offer and can only do so using MP. However, the exception obliterates by no means the general rule.

The issue of acceptance has already had a significant amount of discussion in the literature, (e.g. Cheong/Tan 2001, Kruppa 2001, Robben 2001). Typically, the arguments can be subsumed into three categories (Kreyer et al. 2002a):

- *costs* which include direct transaction costs and fixed costs of usage plus the cost of the technical infrastructure for the customer (e.g., a new mobile phone),
- *security* which includes not only integrity, authorization, authentication, confidentiality and non-repudiation of transactions, but also the issue of subjective security from the customer's perspective,
- *convenience* which includes any issues related to ease and comfort of use.

Essential conditions can occur as functionality requirements such as the capability to pay in a certain scenario, to use a certain method of settlement or to execute picopayments. Typically, these can also be assigned to the above categories.

### 3.2 The individual set of essential conditions

In the named categories there may be fundamental conditions which are universally valid, e.g. a minimum level of fraud protection. But an analysis of acceptance criteria must consider that every user has his own preferences, expectations and needs concerning the use of a payment system, e.g. his buying and payment habits or the level of his willingness to take risks.

This leads to a different set of essential conditions for any single user according to his preferences.

Table 2 proposes a rough scheme for the representation of an individual set of essential conditions. It uses the morphological method (Zwicky 1966) and allows the structured comparison of the characteristics of a given MP procedure with the preference pattern of a single user or a group of users, e.g. the target group of a merchant or payment service provider.

**Table 2: Morphological box of acceptance criteria**

characteristic	instance				
direct costs	transaction costs				fixed costs
	none	low	medium	high	
technical requisites	text-message exchange	Internet-enabled phone	dual-slot/dual-card phone	payment software	
confidentiality of data	low		medium	high	
convenience	ease-of-use		payment transaction time		
	easy	complicated	short	long	
acceptance points	number			spread	
	low	medium	high	national	international
payment scenario	MC	EC	stationary merchant (person/automat)	C2C	
amount level	picopayment	micropayment	macropayment ≤ 50 €	macropayment > 50 €	
method for settlement	pre-registration necessary	method			
		prepaid	direct debit	credit card	phone bill
charging time	before transaction		at the time of transaction		after transaction
PSP	MNO	bank	FSP	spec. intermediary	other

The scheme is based upon and enhances the acceptance criteria developed in (Pousttchi et al. 2002), as the organization of the scheme was changed according to the categories in section 3.1 and two rows were exchanged. We canceled the row "target group" with the sub-characteristics "age group" and "frequency of use" because these items did not prove their relevance in the course of our examinations. On the other hand, we found important differences in the perception of the different payment service providers (PSP) by the customer. For this reason, we added the row "PSP" which originates from the less customer-centric analysis in (Kreyer et al. 2002a).

A closer description of the general scheme and examples for the use in the described manner are presented in (Pousttchi et al. 2002). The modified scheme as shown in table 2 served as a basis for our empirical studies on customer preferences.

The criteria "amount level", "method for settlement" (along with "charging time") and "PSP" have been already examined closely in (Khodawandi et al. 2003) and thus will be omitted in the following.

### 3.3 Relevance of the criteria

After emphasizing in section 3.2 that there is a different set of essential conditions for any single user according to his preferences, we will now examine the relevance of the different acceptance criteria.

For this purpose we present selected results of the survey MP1, sorted according to section 3.1. Some very specific functionality requirements had to be excluded from the categories and listed them separately.

In MP1 each criterion was rated with one of five alternatives ("very important", "important", "partly/partly", "unimportant", "very unimportant"); we state an *approval* if the rating falls into one of the first two. Subsequently, interviewees were asked for the three most important criteria out of all.

The criteria of the category costs are shown in table 3. *None or low costs* refers to direct costs of the procedure (basic and transaction fees).

**Table 3: Approval for criteria of the category costs**

critierion	approval
none or low costs	92%
purchase of a new mobile device not necessary	83%

Direct costs appear as the second most important criterion (see fig. 2). They are rated "very important" by about 70% and "important" by 21%, while less than 1% rated them "unimportant" or "very unimportant".

For an annual basic fee, the mark of 5 € showed as the critical limit: While 37,2% would not accept any basic fee at all, 18,7% would accept up to 2,50 € and another 35,6% would accept up to 5 €. Only 8,5% would accept more than 5 €.

Being proposed an alternative procedure without any basic fee, but with a transaction fee of 0,10 €, about a third accepted, another third remained indifferent and one third rejected the use under these conditions.

The criteria of the category security are shown in table 4. Apart from *confidentiality of data* which is the central security feature of every MP procedure, the functionality requirements *confirmation*, *cancellation* and *anonymity possible* fall in this category.

**Table 4: Approval for criteria of the category security**

critierion	approval
confidentiality of data	96%
confirmation of the payment via SMS or e-mail	89%
cancellation possible	86%
payment transaction is anonymous	66%

*Confidentiality of data* proved by far to be the most important of all criteria. It is not only the first for the question on the most important features (see fig. 2), but above all, rated "very important" by more than 90% (outpacing the next criterion by 20 percentage points). About two thirds are also highly interested in confirmation and cancellation features, whereas for anonymity this is only true for 44%.

The criteria of the category convenience are shown in table 5. These contain mainly three domains: the operating sequence itself (with features as *easy handling* and *fast processing*), the initialization phase before the first use (with features as *no pre-registration necessary* or *no installation of software*) and the coverage of the procedure (with features as *high number of accepting merchants* or *payment abroad*).

*Easy handling* and *fast processing* proved here to be the most important criteria (69% respectively 60% rated "very important"). *Payment abroad* and *no pre-registration* gained the lowest interest (rated "very important" only by 28% respectively 26%).

**Table 5: Approval for criteria of the category convenience**

critierion	approval
easy handling	93%
fast processing of the payment transaction	91%
high number of accepting merchants	85%
easy learnability of the payment procedure	81%
no installation of software on the mobile device	72%
payment abroad possible	51%
no pre-registration necessary	45%

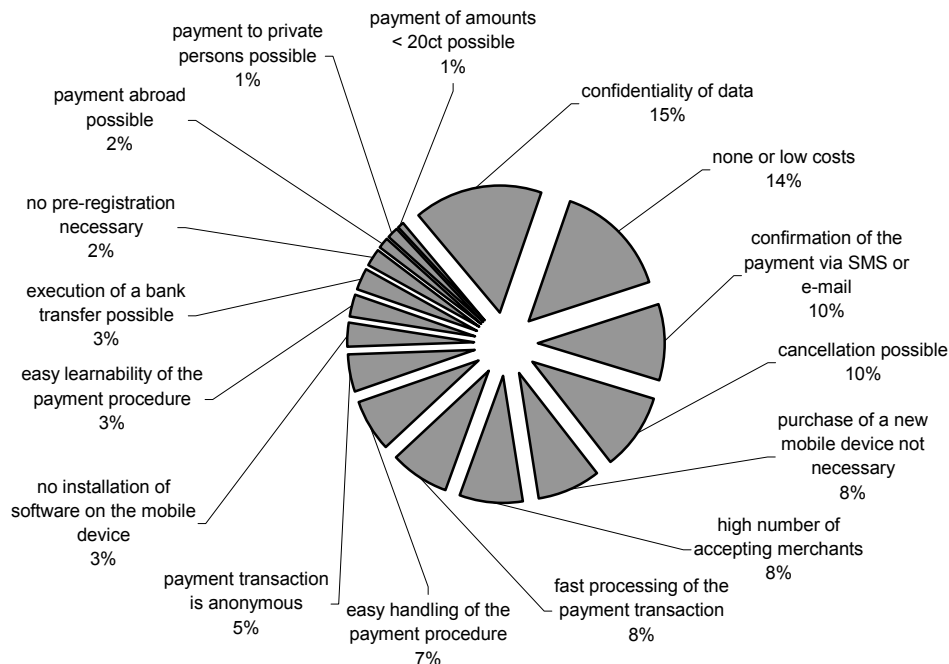
The criteria which are functionality requirements and were not assigned to one of the above categories are shown in table 6. One could argue to assign them to the category convenience, but we judge that they are too specific to fit into the frame. We acknowledge that this could be worthy of discussion, as well as the assignment of many other functionality requirements (e.g. *no pre-registration*) to the above categories instead of aggregating them here. Our aim in doing so was to make the category tables as significant as possible and to exclude only special cases.

**Table 6: Approval for criteria which are special functionality requirements**

critierion	approval
execution of a bank transfer possible	47%
payment of amounts < 20ct possible	33%
payment to private persons possible	29%

For each of the three criteria the approval consists roughly one half each of "very important" and "important"; indifference ("partly/partly") comprises between 20 and 30%. Especially for the last two criteria, the disinterest of the customers is noteworthy: Picopayments were even rated "very unimportant" by 28%, C2C-payments by 23%.

Subsequent to the issue of *absolute relevance* for each of the different criteria we also examined the *relative relevance*. The frequency of the different criterias' relative occurrence among the selection of the three most important criteria of MP procedures is depicted in fig. 2.



**Fig. 2: Most important features of MP procedures**

As the comparison of the absolute and relative regard shows no inconsistencies, we receive a well-rounded picture. This allows us to conclude that the examined essential conditions can be put in an order of relevance and to derive several statements:

- *Confidentiality of data* can be clearly identified as the most important criterion, with more than 90% of customers rating it "very important". The second most important criterion are *direct costs*. Due to the fact that it is only rated "very important" by a little more than 70% of customers, we determine a clear distance between the two. These two, again, clearly outperform any other criteria.
- Convenience issues are of high absolute interest, especially *easy handling* and *fast procession*, followed by *coverage*. But if it comes down to a direct competition to security and cost issues, convenience always stays in the back row.  
Thus, convenience issues will influence the decision between MP procedures primarily if customers consider these as (equally) satisfactory in security and cost issues. For cost issues, we already gave an idea of what would be satisfactory to the customer.
- The issue of *pre-registration* is not of high priority. This is in agreement with the facts that only 9,6% reject pre-registration (Khodawandi et al. 2003) and that anonymity also is not of very high priority.
- As for *picopayments*, from our view it is questionable if the remarkable disinterested will remain on the same level or if the rising importance of innovative mobile applications and services (e.g. location based or gaming) which are priced on the picopayment level will change this attitude.
- The C2C scenario is clearly disapproved by customers in our study (see also section 2) and simple bank transfers via an MP procedure are considered of low interest.

As already mentioned in section 3.1, the high impact of security issues is not limited to effective (objective) security. Contrariwise, the most important cause of refusal of MP are issues related to *subjective security* (Khodawandi et al. 2003).

If we link the afore mentioned statements to our deliberations of section 3.2, we may understand the statements as rules for the construction of an *average set of essential conditions* which is highly relevant for the development and design of MP procedures.

However, fulfilling essential conditions only removes obstacles, but still provides no strong incentive to use an MP procedure.

#### 4 COMMENSURATE CONDITIONS

In section 1 we introduced two steps for turning a mobile phone user into an MP user: Firstly to remove the obstacles and gain acceptance, secondly to turn this acceptance into actual usage. For the latter, we claimed the necessity of fulfilling *commensurate conditions*.

In section 2 we stated that in scenarios others than MC, MP can be simply understood as an MC application which provides the completion of a payment. We may add that even in the MC scenario, where MP appears as an inherent functionality, it can be understood in this way.

One way to analyze and evaluate the prospects of success of an MC application is the approach of (Pousttchi et al. 2003) which proposes an application of the theory of informational added values on EC and MC. The approach addresses two of the three most important directions of strategic management, the requirements of customers (market based view, strongly influenced by (Porter 1980)); and the core competencies for the strategy (resource based view, recurring to (Hamel/Prahalad 1994)). For purposes of this paper, we only refer to the market based view.



The *theory of informational added values* was introduced by (Kuhlen 1996). It discusses the impacts of information work in information markets. In order to determine the different influences and to isolate criteria, Kuhlen chooses the analytical approach and separates the qualitative aspect from the aspect of utility, thus helping to understand and discern conditions and results.

He terms resulting gains as informational added values (IAV) and classifies them into eight main types: efficiency, effectiveness, aesthetic-emotional, flexible, organizational, strategic, innovative and macroeconomic added values. Furthermore he subdivides all IAV into two categories, the first four on a macro-level, impacting individuals and the second four on a micro-level for entire organizations. Micro IAV may contribute to or even result in macro IAV.

The key issue of the approach of (Pousttchi et al. 2003) is the claim that the use of electronic and mobile communication technology is only remunerative if it results in obtaining distinct supplementary IAV. For our reflections on MP as an MC application, we concentrate on IAV on the micro-level. These include

- *efficiency added values* which cover the increase of operating efficiency and cost-effectiveness,
- *effectiveness added values* which cover an augmentation in output quality. An MC instance would be increased customer satisfaction for a parcel service through enhanced skills in shipment tracking (if this solution at the same time allows decreasing the number of call center operators, we also have an efficiency added value),
- *aesthetic-emotional added values* which cover increase of subjective factors as well-being, prestige or activation of the users' play instinct,
- *flexible added values* which cover a shift to a higher level of flexibility (this is particularly important in the production of goods and services consisting of information).

As we regard MP as an MC application, we claim now that customers will use an MP procedure if (and only if) they obtain IAV through this usage. These IAV may originate of one or more of the presented types. In any case, they have to be supplementary compared to the use of any other payment system through the customer in his current situation.

From the afore mentioned we derive the proposition of the criterion of the obtainment of supplementary IAV as the commensurate condition for the actual usage of an MP procedure.

Some typical examples for this would be the use of MP

- with a public transport ticket machine when the user otherwise had to change money for obtaining the necessary coins (efficiency added value),
- if a user buys a good from another user via the Internet and otherwise had to make a bank transfer and wait for several days for a confirmation (efficiency added value),
- if a user intends to use an information service with his mobile device or in another situation where he only can use MP and otherwise would not be able to make the transaction at all (effectiveness added value)
- if a merchant realizes IAV through the use of MP and partially hands this down to the customer, typically in the form of a price reduction.

## 5 CONCLUSIONS

In this paper we examined the conditions for acceptance and usage of MP procedures. We identified *essential conditions* which belong to the categories costs, security and convenience. As different preferences lead to an individual set of essential conditions for any single user, we provided a scheme for their representation and, based on these results, analyzed the relevance of the different criteria. Subse-

quently we proposed an approach to a commensurate condition for the usage of MP procedures based on the theory of informational added values.

The outcome of the paper is, above all, a set of essential conditions and an order of relevance for these conditions based on empirical results.

These results allow deriving straight recommendations for (prospective) MP service providers as well as for merchants, especially for development and design of MP procedures, but also for the different business models.

One further recommendation we would like to underline is taking into account the effect of *subjective security* and the fact that there is no *technical* solution to this problem.

Regarding section 3.3, we have to advise caution if trying to extrapolate the results to other markets. Among other things, the results strongly depend on the development state of banking infrastructure and of behavior patterns of the population.

An example for the first one is the low relevance for C2C payments and the bank transfer functionality. When we discussed this issue e.g. with experts from Central and Eastern European Countries, they gave a market assessment which was absolutely contrary in this issue as they experience a lack in other payment systems capabilities. The conclusion is that MP could take over completely different roles in different markets.

An example for the second is the trade off between security and convenience, e.g. concerning the issue of data protection in excess of the threat of material damage.

For a general outlook on mobile payment we have to state that in mobile commerce, the role of mobile payment is undisputable. But MP has the potential to go far beyond this and to establish itself as an own payment system throughout all scenarios, if the right conditions are laid down now. MP procedures have to focus on customers' needs as they are secure, cost-effective and easy to handle; their use must provide informational added values. Apart from the customer-centric focus of this paper, future of mobile payments depends on collaboration between the market participants, notably in the issue of standardization. The issue is not to take a bigger piece of the cake - the issue is to enlarge the cake.

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