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## **Mobile Payment Procedures: Scope and Characteristics**

by

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## **MOBILE PAYMENT PROCEDURES: SCOPE AND CHARACTERISTICS\***

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## **MOBILE PAYMENT PROCEDURES: SCOPE AND CHARACTERISTICS**

**Abstract.** The existence of standardized and widely accepted mobile payment procedures is crucial for successful business-to-customer mobile commerce. Customers' acceptance of mobile payment (MP) procedures mainly depends on the issues of cost, security, and convenience. In particular, it is important that a procedure can be used over a variety of payment scenarios such as *mobile commerce*, *electronic commerce*, *stationary merchant*, and *customer-to-customer*. Current payment procedures can be categorized by using *strategic*, *participation* and *operational* criteria, based on the morphological method. The scheme we propose allows us to unambiguously identify and characterize any given mobile payment procedure. The proposed scheme allows three basic types of applications: merchants and customers can analyze and represent their preferences for MP procedures in a structured way, (prospective) mobile payment service providers may analyze their market expectations and develop MP procedures according to these, and different market participants may use it as a basis for standardization.

**Keywords.** Mobile Payment, Mobile Commerce, Payment Scenarios, Mobile Added Values, Standardization.

## **1 Introduction**

The ever growing number of mobile phone users as a target group represents an enormous potential for mobile commerce (MC) as a new level of electronic commerce (EC). For the purpose of this paper, we define EC as any kind of business transaction, in the course of which transaction partners employ electronic means of communication, be it for initiation, arrangement, or realization of performance (ECOM 1998). We define MC as a subset of these, on the condition that at least one side uses mobile communication techniques.

Currently, there are already 1.4 billion people using mobile phones (over 80% of them located in Asia, Western Europe and the US), and the numbers are expected to rise to over 2.3 billion in 2005 (Graumann and Koehne, 2002). This is especially interesting, since, in most countries, the penetration of mobile phones is growing even faster than the Internet. In Western Europe, over 64% of the population uses a mobile phone, while only 35% use the Internet. (Note: In the US, 55% of the citizens have Internet access, while only 40% of the population uses a mobile phone.) According to recent studies, worldwide MC revenues are expected to rise from approximately 3.4 billion U.S. dollars in 2002 up to 22.2 billion U.S dollars in 2005 (Graumann and Koehne, 2002). However, so far, most mobile applications are still transformations of conventional Internet applications or EC business models for mobile devices. In order to be successful (and thus gain profits) in an MC setting, this is not sufficient. New business models and added values are necessary.

Typical value-added features of MC originate from ubiquity, context-sensitivity, identifying functions, or command and control functions of MC applications (Pousttchi et

al., 2003). In addition to technical issues, such as packet-oriented data transmission, adequate payment procedures are most important in realizing their potential. Since companies are not going to invest in the development of innovative MC applications or services unless they can be charged for appropriately, the existence of standardized and widely accepted mobile payment (MP) procedures is crucial.

Because this is especially true for business-to-customer (B2C) MC, we focus on B2C MP in this paper. The conditions for implementing easy-to-use MP procedures on the customers' side are good. As a study by Accenture reveals, more than 30% of interviewed customers would like to use their mobile phone as a wallet (Graumann and Koehne, 2002). Therefore, a mobile payment function provides an added value for the customer – even more value if it enables customer-to-customer (C2C) transactions and thus, an incentive to use and spread an MP procedure. Therefore, in this paper, we will examine C2C MP along with B2C MP. We do not question the justifiability of research focused on B2C issues and underline the importance of industry research in this field. However, a general MP definition not considering C2C MP (e.g., in Mobile Payment Forum 2002) seems too narrow.

Thus, for our purposes, we define mobile payment as a subset of MC focusing on the completion of payment. We focus, therefore, not on technical issues (as several industry consortia, e.g., Paycircle or the Mobile Payment Forum) or the clearing process, but on the payment interface to the customer. As will be shown later, MP is crucial for, but not limited to MC scenarios. On the contrary, usability of an MP procedure in scenarios other than MC is relevant for its acceptance.

After we reflect on the issue of acceptance, we identify, classify, and aggregate

characteristics of MP procedures within a morphological box (Zwicky, 1966). This allows us to distinguish actual and foreseeable types of MP procedures more precisely. Finally, we address the issue of standardization and discuss possible applications of the scheme for relevant market participants.

Please note that our discussion of a general payment method, such as credit card usage, electronic payment, or MP, refers to the term *payment systems*. When we talk about concrete solutions such as Paypal, we use the term *payment procedures*.

## **2 Acceptance of MP**

### **2.1 General acceptance**

An examination of the development of payment procedures 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 percent 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.

In the course of a study on mobile banking (Speedfacts Online Research, 2001), more than 16,000 Internet users were interviewed about their payment preferences. On the issue of general acceptance, about two-thirds stated that they would definitely pay, or would consider paying, using their mobile phones. The most significant acceptance was

from people already using electronic banking. On the issue of preferred payment systems, the mobile phone would be preferred by about a quarter of the interviewees for micropayments (less than 2.50 €), a third for macropayments from 2.50 € up to 50 €, a fifth for macropayments up to 250 €, and by 13% for amounts over 250 €. In the segment between 12.50 € and 50 €, paying by mobile phone would be the most preferred method (Fig. 1).

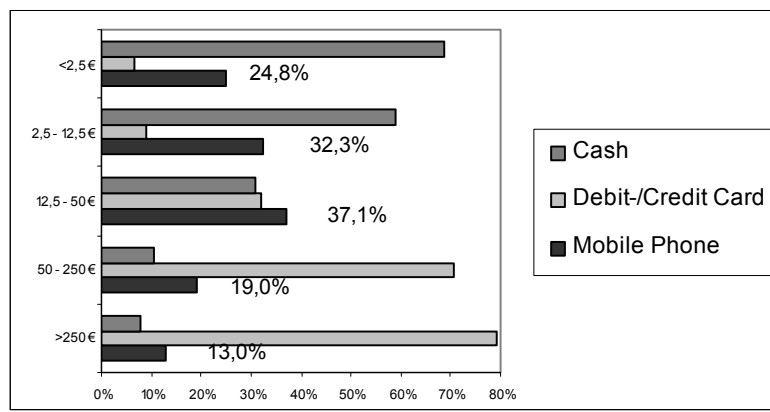


Fig. 1: Preferred payment methods of mobile Internet users (Speedfacts Online Research 2001)

These results show that general preconditions are favorable for customer acceptance of MP. However, we believe that the decisive factor for a market breakthrough is the acceptance and actual use of concrete MP procedures. This represents a major failure risk in the transformation of general MP acceptance into concrete acceptance and use.

## 2.2 Acceptance of individual payment procedures

If the key to acceptance of MP is in the hands of customers, this leads to the question of determinants influencing the acceptance of a single MP procedure. Furthermore, other participants (in particular, merchants) will only be able to follow customer preferences up to a defined point, where disadvantages begin to outweigh the advantages.

While the issue of acceptance has had a significant amount of discussion in the literature, (e.g. Cheong, 2001; Kruppa, 2001; and Robben 2001), most arguments can be subsumed into three categories:

- *Cost* – which includes direct transaction costs and fixed costs of usage, plus the cost of the technical infrastructure for the customer (e.g., a new mobile phone) and the merchant (e.g., the integration of the payment solution into the existing IT infrastructure).
- *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 ease and comfort of use, as well as the attainment of concrete benefits from use.

For the latter, it is important that a procedure is not limited to MC scenarios, but can be used in other settings, as well. That is, it should be possible to use the procedure whenever, wherever, and for whatever kind of payment the user desires.

### **2.3 Relevant payment scenarios**

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

Brokat defines three “worlds” for transactions -- the “r-world”, “e-world”, and “m-world” (Kruppa, 2001). We agree with this distinction regarding the point of sale (or service), but we will differentiate among them a little more precisely and, for the reasons mentioned in section 1, 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)* 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 a unique proposition only in MC (Table 1).

**Table 1:** Relevant MP scenarios

Scenario	Scenario Description	Competing payment
<i>MC scenario</i>	New applications and services (e.g., context-sensitive information or video/audio streaming on mobile devices)	- - -
<i>EC scenario</i>	All kinds of B2C EC excluding MC (e.g., purchase of goods or content via the Internet)	Offline Debit-/Credit Card e-payment
<i>Stationary merchant scenario</i> <i>(person)</i> <i>(automat)</i>	"Brick-and-mortar" commerce with transactions between a person (customer) and: - a person (e.g., cashier) respectively - a vending machine.	Cash Debit-/Credit Card
<i>C2C scenario</i>	Money transfers between individuals (e.g., pocket-money for children, settling debts for small amounts)	(Cash) (Offline)

For a focus on technical issues (e.g., protocol development), it is often useful to define basic scenarios with regard to the type of goods or services delivered instead of the point of sale. A good example is provided in Paycircle, 2002. For our focus, this is only one characteristic that we will examine along with the payment frequency in section 3.

The distinction of the scenarios is not only important for the examination of the different payment procedures to be discussed in section 4, but also for a brief look at the strategy of market entry and its effects on the development of payment procedures.

We stated in section 1, that MP is crucial for, but not limited to MC scenarios. In any payment scenario, there is at least some MP procedure that makes sense; most MP procedures are usable in more than one payment scenario (Kreyer et al., 2002).

Before we discuss these payment scenarios, it is useful to reflect briefly on the relevance of usability in each scenario as it affects the acceptance and diffusion of the procedure. Figure 2 shows the acceptance of MP by customers in the different payment scenarios as derived from an empirical study on the German market (Khodawandi et al., 2003).

- **Mobile commerce scenario.** On the one hand, as we stated above, MP allows the potential of mobile commerce to unfold. Our recent study in Germany, Europe's biggest market for cellular phone networks, showed that 80.3% of customers who intend to use MP answered that they will use it in the MC scenario (Figure 2). However, MC itself has represented only low revenue rates up to now, and it is questionable if customers will accept an MP procedure just for the possibility of using it occasionally in a MC setting. The dilemma could arise that nobody uses an MP procedure because it is limited to MC, and nobody uses MC because there is no widely accepted MP procedure.
- **Electronic commerce scenario.** In opposition to MC, EC has already demonstrated good revenue potential. However, in the view of merchants, the payment problem still remains unsolved, and payments for most transactions are conducted through offline methods (e.g., Robben, 2001), with obvious disadvantages. Additionally, the target group of EC users could be very interested in (and interesting for) MP. For these reasons, one might assume that the EC scenario would be of high relevance. However, as we see in Figure 2, this appears not to be the case. Furthermore, the study showed 41% of customers explicitly disapproving of the use of MP in the EC scenario. An explanation may be that from the customer's viewpoint the payment problem in EC is solved. However, this point is still subject to closer examination.

- **Stationary merchant scenario.** The revenue potential of the stationary merchant scenario is definitely the highest of the four scenarios. However, it remains uncertain not only as to whether the average mobile phone user is the right target group for a pioneer application like MP, but also as to whether it will be possible to convince traditional merchants to accept a payment procedure prior to having a significant number of regular MP users. In any case, Figure 2 shows that customers express a substantial demand for MP usage in this scenario, especially when it comes to vending machines of all types (e.g., ticket machines, cigarette automats, parking ticket machines).
- **Customer-to-customer scenario.** The opportunity to transfer money from customer to customer represents the least incentive for the use of an MP procedure. Although for special target groups (e.g., young people) C2C MP may be the main reason to use an MP procedure. This is unlikely for the average user.

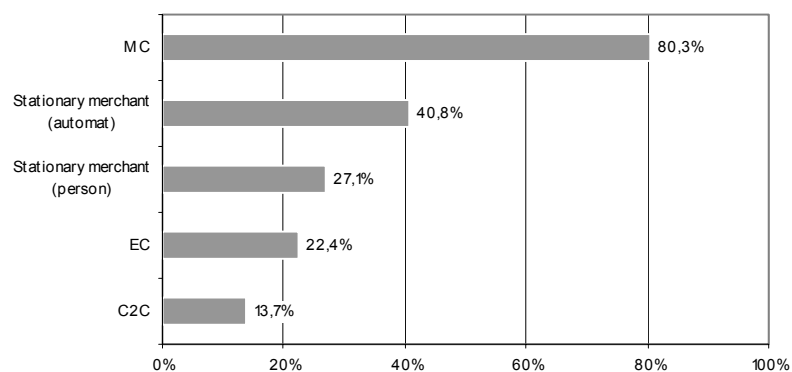


Fig. 2: Acceptance of MP in the payment scenarios (Khodawandi et al., 2003)

After determining and examining the general payment scenarios and the relevance of each of these for the development of MP procedures, we will now develop a classification

scheme identifying other relevant characteristics of MP procedures.

### **3 Typical Characteristics of MP Procedures**

#### **3.1 General remarks**

Currently various MP procedures are emerging in the MC market. (For an overview see Henkel, 2002.) As shown in section 1, MP procedures appear to play a major role in the diffusion of MC. Credit card issuers, as well as financial services providers or start up companies, are realizing its potential and are trying to establish their payment procedures in order to gain further revenues from customers and/or merchants.

In order to decide weather or not these procedures are actually diverse (other than their labeling), and what criteria differentiate them from one another, a closer examination of MP procedures is necessary. First, this analysis will establish a common framework in order to define and distinguish the different technical terms related to MP. This will allow us to unambiguously identify any given MP procedure. The procedures can then be compared and their relevant characteristics identified. This will be helpful for further research, since it allows us to rate MP procedures according to their chances of success, reveal their limitations, and thus provide recommendations for MP service providers as well as for other MP stakeholders (e.g., customers or merchants).

Within this paper, we focus on three main issues relevant to MP procedures. First there are characteristics that concern the general positioning of a MP procedure within a given market. Second, we discuss issues concerning the participating parties, especially focusing on MP users' interests. Finally we consider MP-inherent, operational topics.

In conducting our analysis, we use the morphological method according to Zwicky, 1966. This method allows us to fractionalize any given problem into its multi-dimensional aspects and to identify the various instances of each aspect. The aspects and their instances can then – as is a key element within the morphological method – easily be summarized and visualized in a table, the so called *morphological box*. When applying the morphological method to given MP procedures we are, through the combination of the aspects and instances, able to structure MP procedures and identify common characteristics, as well as major differences. Furthermore, we can identify missing elements and are able to propose improvements as well as new solutions. The following sections will give an overview of the analysis and present our results in a morphological box. To facilitate quick understanding, the aspects as well as the instances are written in italics.

### 3.2 Strategic Questions

First we have to analyze the suitability of a given payment method for the identified *payment scenarios*. The relevance of these different scenarios has already been discussed in section 2.3. It is now necessary to examine whether the different payment procedures will actually work within the described scenarios of *MC*, *EC*, *stationary merchant (person)* as well as *stationary merchant (automat)*, and *C2C* (Figure 3).

payment scenarios	MC	EC	stationary merchant (person)	stationary merchant (automat)	C2C
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Fig. 3: Characteristic “suitability for different payment scenarios”

Another crucial question is, whether the selected payment model is suitable for various

invoice amounts (*payment levels*, Figure 4). In the US, 40% of online merchants want to offer items costing less than \$10, but transaction fees of most payment procedures do not make this cost-effective (Sutherland 2003). Payment categories are usually differentiated in *picopayments* (which we define as amounts of 10 cents or less, down to fractions of a cent), *micropayments* (amounts larger than 10 cents up to \$5), lower (amounts from greater than \$5 to \$50) and higher *macropayments* (amounts higher than \$50) (section 2 and (Kieser 2001)). While within the category of macropayments transaction costs can usually be neglected, they are critical when it comes to pico- or micropayments, since they may be greater than the total revenue made with the service. An MP procedure may, therefore, be considered a reasonable means of payment, as long as the payment amount is larger than its total transaction costs.

payment levels	picopayments ( $\leq 10$ cents)	micropayments ( $> 10$ cents to \$5)	macropayments ( $> \$5$ to \$50)	macropayments ( $> \$50$ )
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Fig. 4: Characteristic “payment heights”

### 3.3 Participants

**3.3.1 General Participants:** Since many different parties can be involved within a payment process, their roles and objectives have to be considered. The integration of a large number of different stakeholders leads to high complexity and difficult negotiations (e.g., concerning the sharing of revenues or payment risks). Besides the customers and merchants who trade (electronic or physical) goods or services and use an MP procedure for settlement, there are other relevant parties involved in the payment process.

Therefore, we examine first which parties may serve as a *payment service provider* (Figure 5). Mobile network operators (*MNO*) usually operate the technical infrastructure

and can be involved in the payment process, as well (e.g., when they offer billing services for third parties). However, they may also operate an MP procedure themselves and provide payment services for customers and merchants. *Banks* or financial service providers (*FSPs*) (e.g., credit card companies) may be involved as a clearing/settlement instance, or they may offer their own MP procedures for their customers. Since they usually have good reputations, they may also be involved as a trusted third party. Both – MNO as well as banks or FSP – already have access to their customers and are accustomed to dealing with financial issues. Another group of payment service providers are newly founded, *specialized intermediaries* whose core business and competency is to operate MP procedures. Finally, there is a group that we refer to as *others*. These usually are old economy companies who develop efficient payment procedures integrated into their own business. One example is the Austrian Railway Company, which offers a mobile payment procedure for its train-ticketing.

payment service provider	MNO	bank/FSP	spec. intermediary	others
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**Fig. 5:** Characteristic “payment service provider”

Besides identifying the different participants, the question of who receives customers’ data (*receiver of customer’s data*) is important (Figure 6). On the one hand, customers are rarely willing to spread their personal data among various institutions or intermediaries. On the other hand, gaining information about customers is one of the most relevant issues for merchants and/or providers in today’s business. Parties, who receive customer data, may be – besides the *payment service provider* – *MNO* (e.g., when handling the billing process) *banks/FSP*, and/or *merchants* (e.g., as an incentive to accept a given MP

procedure). However, within MP procedures, it is also possible that *nobody* receives the customer's data (this is typical when paying with a prepaid card for a certain service or buying goods with digital cash anonymously). We also need to mention that MNO, bank/FSP or even the merchant may be identical to the payment service provider and receive data on this account.

receiver of customer data	payment service provider	MNO	bank/FSP	merchant	nobody
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Fig. 6: Characteristic “receiver of customers’ data”

**3.3.2 Customers:** Having discussed the relevant stakeholders and their interests, we now take a closer look at customers, since they are the key for MP acceptance. One way to classify MP procedures is based on the *need for pre-registration* through the customer (Figure 7). Besides a difference in convenience, the need for anonymity can be the deciding factor regarding an offered solution. If customers have to register, they have to transfer personal data to some other institution and may feel as if they are being monitored. Therefore, they may favor payment solutions such as prepaid cards that allow them to remain anonymous (i.e., depending on the purchased products, the payment levels, or security issues).

pre-registration needed?	yes	no
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Fig. 7: Characteristic “pre-registration”

Another important issue influencing both convenience and the establishment of MP procedures is the technical infrastructure needed on the customers’ side (*technology*



*required*) in order to participate within a certain payment procedure (Figure 8). As evidenced by SET (Secure Electronic Transactions), a highly-sophisticated technology may be objectively very secure and advanced, but it will probably fail if it is difficult to use, or is not widespread. While some MP procedures are based on voice messaging only, a large number of MP procedures are based on simple *text-message exchange* or Wireless Application Protocol (WAP), which requires *Internet-enabled phones*.

Besides the necessity to transfer data via one of the above-mentioned standards, some MP services, in addition, require *dual-slot* or *dual-chip-phones* on the customers' side. Dual-slot-phone-technologies use the regular SIM-card (subscriber identification module card) to identify the mobile device and also provide a second card-slot (e.g., for a credit- or debit card integrated within the mobile phone). When paying for a service or product, the user is asked to insert his credit or debit card into this second slot and to authenticate himself (e.g., via a Personal Identification Number (PIN)). The phone then serves as a regular payment terminal, similar to the ones already used with stationary merchants. One of the few existing dual-slot payment systems, ItiAchat, has been initiated by France Telecom and the Groupement des Cartes Bancaires. The procedure allows one to conduct payments within the EC, MC, and stationary merchant payment scenarios.

Dual-SIM-technologies operate similar to this method, only the second card (a credit or debit card the size of a SIM-card) is already integrated in the mobile device – an extra slot is not needed, and, therefore, some of the shortcomings of the dual-slot technology (e.g., usually heavier, more bulky devices) are overcome. The Electronic Mobile Payment Services (EMPS) may serve as an example for this Payment type. Since it is still in its pilot-phase, so far it can only be used in an EC scenario ([www.ruoka.net](http://www.ruoka.net)) or with a

stationary merchant (the movie theatre “kinopalatsi”), but may as well be used within the MC scenario.

Another application used within some payment models is a *special payment software* needed on the customer side (e.g., a software on the mobile device which generates digital coins or identifies the user when paying via the mobile phone).

technology required	text-message exchange	internet enabled phone	dual-slot/dual-card phone	special payment software
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Fig. 8: Characteristic “technology required on the customers’ side”

### 3.4 Operational Issues

After discussing the issues concerning the different stakeholders of MP procedures, we will now focus on criteria that allow us to distinguish MP services according to their functions.

Any given MP procedure can be distinguished according to its *basis of payment* (Figure 9), which can either be *token- or account-based* (Cheong, 2001). Token-based payment procedures use tokens to represent monetary value (e.g., when payment software generates digital cash (“electronic coins”) on a mobile device). The tokens are exchanged during the financial transaction, and the customer usually needs to create virtual money (e.g., with a certain software) and store it on the mobile device. Token-based MP procedures usually allow the user to remain anonymous when paying and also permit pico- or micropayments, since the tokens can be created in any given fraction of “real” money. However, most MP procedures are account-based. The user needs to register with the payment provider, and all payments are settled via his account.

basis of payment	token-based	account-based
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Fig. 9: Characteristic “basis of payment”

The suitability of an MP procedure for various *payment frequencies* is another important factor concerning the establishment of MP procedures (Figure 10). When *paying per time unit*, the customer is charged for the time he has used a certain service (e.g., playing a game or sending data). However, *payments per product unit* is probably the most frequent payment method. With this method, an event-based fee is charged (e.g., for the download of an MP3 file or the purchase of a book) regardless of the time used to purchase it. A third payment method can be the *subscription* of goods or services. The subscription of services may be limited to a certain number of uses (e.g., the use of an information service twice a month), certain volumes of a product (e.g., brokerage information of selected shares once a day), or one may use the service without any limitations (e.g., when subscribing to a database).

payment frequency	pay per time unit	pay per product unit	subscription / standing order
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Fig. 10: Characteristic “payment frequency”

Focusing on the time of account settlement (*deduction time*), there are different methods for charging services or goods to the customer. Those methods can be differentiated according to the time the payment is actually settled (Figure 11). First, there are *prepaid* methods. The customer either buys a smart-card, where the money-value is stored, and then pays off of this credit for goods or services desired, or he can upload a digital wallet with electronic coins on a prepaid basis. Subscription of special services can be another

prepaid method in which one pays for something first and receives the service later at a specific point in time. All of these prepaid services usually allow anonymity on the customer's side and are already used for EC payments. Another category of account settlements is *instant-paid* methods. These payments are triggered as soon as the customer accepts the offer. An example of this payment method is direct debiting systems such as the “Maestro” debit card or the French “Carte Bancaire”. Debit cards have – in Europe and North America – a high penetration rate among the population and are widely accepted within traditional shops as well as in EC payment scenarios. They are easy to use, and all that is needed for the customer is a checking account at the bank issuing the card. A third method of charging for goods or services involves so called *post-paid* services. The customer purchases a product or service and is charged for it later. Typical examples are so called “offline-methods” such as “collect on delivery” or invoices. Credit-card payments or payments via the phone bill are other typical post-paid payment methods. These are typically used in traditional payment scenarios such as for stationary merchants or for catalog shopping. They are also widespread and generally accepted.

deduction time	prepaid	instant-paid	post-paid
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**Fig. 11:** Characteristic “deduction time”

Besides the actual settlement time, the number of offered payment methods that can be used for the settlement (*method for settlement*) is relevant (Figure 12). Since the customer is already used to having different choices of how to pay for a purchased good and is likely to chose a new payment method only if it allows him to use his accustomed payment practices, the number of different payment methods offered by the provider to

settle payments will contribute to the acceptance of the payment method itself. As mentioned above, typical settlement methods include payments via *smart or prepaid-cards* as well as innovative instruments such as *electronic cash or digital wallets*. Most MP-users, nevertheless, prefer “traditional” means of settlement, such as *direct debiting* – which is especially popular in Europe – or *offline payments* (e.g., via invoices). Credit cards are another popular method to settle payments. In some countries (especially Japan) it is also very common (and allowed) to settle debts via the *telephone bill*.

method for settlement	smart cards/ prepaid cards	electronic cash/ digital wallet	direct debiting	offline payment	credit card	telephone bill
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**Fig 12:** Characteristic “method used for settlement”

### 3.5 Morphological Box of MP Characteristics and Instances

Based on the discussion in the sections above, the main characteristics of MP procedures and their instances can be summarized in Table 2.

**Table 2:** Morphological box of MP characteristics and instances

Characteristic		instances					
strategic	payment scenarios	MC	EC	stationary merchant (person)	stationary merchant (automat)	C2C	
	payment levels	picopayments (≤ 10 cents)		micropayments (> 10 cents to \$5)	macropayments (> \$5 to \$50)	macropayments (> \$50)	
Participants	payment service provider	MNO	bank/FSP		spec. intermediary	others	
	receiver of customer data	payment service provider	mobile network operator	Bank/FSP	merchant	nobody	
	pre-registration needed?	yes			no		
	technology required	text-message exchange	internet enabled phone	dual-slot/dual-card phone	special payment software		
operational	basis of payment	token-based			account-based		
	payment frequency	pay per time unit		pay per product unit		subscription / standing order	
	deduction time	prepaid		instant-paid		post-paid	
	method for settlement	smart cards/ prepaid cards	electronic cash/ digital wallet	direct debiting	offline payment	credit card	telephone bill

As mentioned previously, use of the morphological method now allows us to analyze any given payment procedure according to these criteria. Various examples are shown in (Kreyer et al., 2002).

## 4 Conclusions

The outcome of this paper is an analysis of the scenarios in mobile payment and of the main characteristics of mobile payment procedures. The proposed scheme allows

primarily three types of applications: i) merchants and customers can analyze and represent their preferences for MP procedures in a structured way, ii) mobile payment service providers may analyze their market expectations and develop MP procedures according to these, and, iii) different market participants may use it as a basis for standardization on one, some, or all of the criteria.

An example for the first type of application, as well as an extension in the direction of the customer's view, is provided in Pousttchi et al., 2002, which also served as a basis for the empirical results in Khodawandi et al., 2003.

The second type of application points to a strategy of MP market entry. In order to do this, we have to put the scenarios in an order of relevance with regard to the intended use of the procedure. The procedure should, then, be developed with special regard to the most important scenarios. This prioritization could well be different for the different types of market participants who may want to act as mobile payment service providers. For an MNO the most important scenario will, of course, be MC. Since banks/FSP up to now have not been very interested in micropayments, this may be the stationary merchant scenario for them instead. However, the top-up (which is the international technical term for recharging mobile subscribers' prepaid account) via MP seems to be extremely tempting for a collaborative solution between a bank/FSP and an MNO; respective solutions based on direct debit with online credit assessment exist (e.g., in the Netherlands and in Belgium).

The need for MP exists. Two notable examples of strong interest are from e-Bay, which even bought the specialized intermediary Paypal primarily for processing the C2C transactions between e-Bay customers (as this is crucial for its core business), or vending

machine operators seeing the chance for dramatic cost reduction through the use of mobile technology.

As a number of studies show, many customers would like to make payments using their mobile phones. However, since standardized MP procedures (or at least standardized interfaces) have not yet evolved, customers are not able to use one MP procedure at numerous merchants, and merchants are not able to address all mobile phone users offering a standardized MP procedure. This situation only leads to disappointed customers who adapt to the new technology very slowly, or may neglect it entirely. The problem has proven to be a major obstacle in the development of MC.

Ways to attain standardization could be through a decreed global standard (e.g., the EDIFACT standard for electronic data interchange by the United Nations) or a proprietary standard (e.g., Microsoft Windows). Although we see efforts in the direction of several technical standards below the procedural level (e.g., the Java and XML payment standards proposed by Paycircle), this solution seems to be a distant prospect.

An alternative approach could be the development of an integrative universal mobile payment system (UMPS) based on an abstraction layer above the procedural level. This UMPS would have to be user-centered and allow us to use any given payment procedure on any given mobile device and network with any given merchant and financial service provider interface. A reasonable solution would allow maintaining the variety of existing MP procedures and the variety of mobile devices. At the same time, customers as well as merchants could be relieved of the need to occupy themselves with the payment problem for mobile solutions.



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## **Appendix I: Tables**

**Table 1:** Relevant MP scenarios

**Table 2:** Morphological box of MP characteristics and instances

## **Appendix II: Figures**

**Fig. 1:** Preferred payment methods of mobile Internet users

**Fig. 2:** Acceptance of MP in the payment scenarios

**Fig. 3:** Characteristic "suitability for different payment scenarios"

**Fig. 4:** Characteristic "payment heights"

**Fig. 5:** Characteristic "payment service provider"

**Fig. 6:** Characteristic "receiver of customers' data"

**Fig. 7:** Characteristic "pre-registration"

**Fig. 8:** Characteristic "technology required on the customers' side"

**Fig. 9:** Characteristic "basis of payment"

**Fig. 10:** Characteristic “payment frequency”

**Fig. 11:** Characteristic “deduction time”

**Fig 12:** Characteristic “method used for settlement”