Towards a Global Mobile Payment Service

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Abstract: *Mobile payment's promise is that users will be able to pay via their mobile phones any time anywhere in whatever currency easily. However the real world mobile payment efforts are still far away from materializing this vision. In this paper we take a view of where we are today and why mobile payments are not there where most experts had predicted some years ago. We also lay our views on how this interesting area will proceed and what are the underlying pros and cons for each actor. Finally we present shortly SEMOPS (www.semops.com), a mobile payment service that has been realized with the aim of satisfying a next generation global mobile payment service.*

Keywords: *mobile payment, mobile commerce, emerging directions, semops project*

1. Introduction

Mobile commerce describes a very broad area, under which any kind of business transaction that is realized even partially with the use of mobile communication techniques and devices can be hosted. Mobile payment is by definition 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. Mobile payment is a subarea of mobile commerce, probably the most important one. Furthermore, mobile payment can be used not only in mCommerce scenarios but easily also in eCommerce ones for specific actions (e.g. user authentication) or even in hybrid forms, where both Internet and mobile procedures are used.

Based on the above definitions it can be stated that today mobile commerce does not exist as a general mean of interaction between business partners. Presently it is very much limited to a small range of products and services for a very small niche market. There are a number of mobile commerce initiations, local undertakings, solutions for specific transaction types or products but they are limited in scope, limited in customer reach and luck general, standardized approaches and openness. There are several international consortia and fora such as SIMPAY (www.simpay.com), Paycircle (www.paycircle.org), Mobey Forum (www.mobeyforum.org), Mobile Payment Forum (mobilepaymentforum.org) etc working towards this direction, however there is nothing on the market that fully conforms to them and represents a global payment service.

As it stands today mobile commerce is basically limited to downloading ring tones, operator logos and some games, filling up prepaid mobile accounts, and paying for parking. However even these scenarios, with the exception of downloading digital content, are rare and scattered. Most of these solutions are following their own technical and business models and they do not cooperate with other approaches.

This market situation does not even resemble the dreams and expectations even from just a few years ago. The systems and procedures that have been developed [7] have failed to reach the critical mass and provide a global payment service. If this is the real mobile commerce practices we are left with, it will definitely not bring the expected revenue streams for mobile network operators (MNO), it will not justify the investments in state of the art infrastructure, it will not be the future mainstream of the mobile communication industry.

The following questions are very much valid if we want to get a clear picture of the full potential of mobile commerce.

- Why are we in this situation?

- What does the near future look like?
- What do we need to do in order to meet the best expectations?

2. The blocking factors

Hindering of mobile commerce is due to many different barriers that arose both in technology and in business, especially after the .com technology crash, which basically has made everyone more reluctant on new approaches that cannot bring immediate profits. Currently, there is no supply on the market, because there is no real demand as there is no way to pay for anything. A new secure, universal, real time payment service could fundamentally change the commercial landscape.

2.1 Lack of interest

There is only a limited selection of products and services available on the market. There are only very few people willing to transact using their mobile devices. It seems like neither the merchants, nor the customers are interested in this type of trade. Why is there such apathy? Is it conscious or a simple result of lack of information?

It is possible that neither party of a possible business transaction can realize benefits – tangible or intangible – from conducting business on mobile channels. It is also possible that even if such benefits were available the parties are just not realizing the full spectrum of this potential. Therefore the key question is whether there are real benefits to be realized by anyone from conducting mobile commerce. It is fair to say that presently it is difficult to find any readily available possible scenario, where anyone would be better off making a mobile trade, rather than acquiring the same product or service the traditional way. Having realized this sobering fact, it is important to see whether this situation is permanent or can be improved to turn mobile commerce into a real value generator. Furthermore we should investigate how one can help the actors (customers, merchants, banks, mobile network operators etc) realizing the full capabilities and risks associated with this domain, because only then one can really take a decision on whether he is interested or not.

2.2 Lack of the right payment service

The commercial environment and the business conditions are not ready yet for mobile commerce, in spite of the fact that the business actors would accept the new transaction channels. Merchants would love to sell products on whatever market and channel that exists, if they can receive money for their service. What they request is assurance that they are going to receive payment in the right amount, in a timely manner and in reliable form. Customers would like to make purchases from a large selection, without fearing to be cheated, in a convenient, user friendly and secure way. However, despite of the fact that both partners of the business relationship are in favor of mobile commerce, a major barrier blocking these types of transactions exists. There is no suitable payment service available on the market that would satisfactorily support mobile commerce.

Some of the basic characteristics that the right payment service needs to have include:

- Security
- Reliability
- Trust and privacy
- Real-time interactivity
- Wide acceptance / general availability

What we need is a mobile payment service available for practically anyone and suitable for any type of transactions in any value. Security solutions should adequately protect both customers and merchants while in parallel respecting their privacy. For the customers, high-level assurance needs to be provided that their payment related sensitive information would not be misused by anyone, neither by the merchant, nor by any other third parties. They should also be protected from fraudulent charges and cheatings. Merchants are also at relatively high-level risk in case of mobile transactions, as they may not even know their customers. Merchants need to trust a service that guarantees that the payment will arrive in the right amount at the specified time. Therefore the users must trust the payment service as such and not necessarily the end-transacting partners. Partial transacting partner trust can be acquainted via

implicit trust relationship delegation, mainly from the right business model e.g. like the one followed by SEMOPS [5]. Theoretically, such a global service could be provided by any trusted third parties, but this concept may contradict to the general service availability requirement. These preconditions severely limit the number of potential actors and eventually only financial service companies and mobile network operators seem to be the right candidates.

A general-purpose payment service has multiple advantages over special purpose solutions, both from usability and also from commercial perspectives. Customers would obviously prefer a service – one service – that can be used for any type of transactions, over many individual services that are only available for specific products, or just for selected merchants, or just for certain commercial situations, in limited geographical areas. The potential of using the payment mechanism in any commercial situation, using the same traditional process on the same handset is the ultimate user friendliness. Introducing a new payment channel for the public – no matter how familiar it is to existing solutions – is always facing barriers and mistrust. If this feeling is further increased by inconvenience then the payment service does not have a chance of being accepted on the market and reaching the critical mass. Merchants also would need a payment service that is accessible for many of their present and future customers, and are not interested in collecting several special-services in order to address small isolated customer groups. Specialized payment solutions will only provide access to a small selected clientele, who was willing to go through the hassle to get access to a service that is only suitable for a specific type of transaction. Where is the upside for the merchant in this case? Most of his loyal customers are paying now with a different method, therefore this approach would not bring extra traffic, nor access to a new market segment; perhaps only some limited cost savings.

Alternatively, in case there is a universal mobile payment service, customers would know, that joining the service provides them access to a large number of merchants conveniently, so it is worth the effort of joining the service and learning, how to use it. Merchants can also rely on the network effect in this scenario. A customer is using the service today for making payment for a specific transaction and if successful the experience will be repeated not only for the same service but for other types as well. As long as the payment process is the same and the service provides satisfactory user experience there is no reason why not to use it repetitiously, time after time in various commercial situations. The learning curve would start with low value payments for preferred transactions, followed by different transaction types still for lower values, and eventually higher priced products and services will also be paid by the same service when trust and familiarity is already established on it.

Universality is also a key factor for reaching satisfactory economics for the payment service. In case special development and dedicated infrastructure is needed just for the sake of a few transactions for selected products, or small markets, then the realization of profitable operation is practically impossible. However even if larger scale investments are required and perhaps more robust infrastructure, but the service is capable of handling different payment types, values, and commercial situations, then chances are that a sound business model can be elaborated that is satisfying the needs of the different actors of the transactions – customers, merchants and payment processors.

2.3 Technology barriers

It is clearly seen that for some transaction types the market is already present, while for others we need more time. Those transactions that are ready for the market, are the simple ones that do not need excessive communication and can be satisfied with the present infrastructure. There is however a number of use cases which are not supported by generally available mobile technology. The present state of mobile technology available currently to the wide public (and not to a specific group e.g. business executives) is a clear barrier for mobile commerce and mobile payment.

Services that can be based on SMS communication are good candidates for early start. However SMS is neither reliable nor secure enough, and most importantly it is very expensive. If someone wants to park and pay for it with his mobile, there is a need for at least one but in some cases up to four SMS messages in total. The cost of communication eventually will be a major part of the transaction cost, although in the perfect scenario it should be marginal. It is quite probable that as long as SMS will be the primary mean of transporting information over mobile networks, the growth of mobile commerce will be quite strongly limited. This is mainly due to the fact that service providers want to address a wide range of clients, and because SMS is available everywhere this is the least common denominator. The

landscape will change in the next years where possibly more advanced capabilities in mobile phones coupled with GPRS and above connectivity will be used by the average mobile phone owner.

Presently the realistic scenario is the use of GPRS communication with phones that support a kind of execution environment such as JAVA. This combination provides already satisfactory user experience – better handsets, faster more reliable communication – cheaper transaction and communication expenses. From a closer look however, the picture is not so bright. In GPRS there is no push service, so anyone needing to send (initiate) information to a handset will have to rely on the "good, old SMS". Sending SMS messages to a JAVA handset sounds quite simple, but the truth is that most JAVA handsets are not capable of receiving and sending SMS messages. For this purpose they rely on the SIM card in the handset, to which the JAVA functionality has no access to, so we are back in the original SMS based transaction world. We should note however that with MIDP 2.0 specifications, one is allowed to push notifications to the MIDlets on the mobile phone by using any communication protocol supported by both the network and the MIDP-enabled device. HTTP, SMS, sockets, and/or other protocols may be supported, depending on the network and the device to which the notification is directed. Therefore it is a matter of time until a wide range of handsets supports MIDP 2.0 and therefore providing real alternatives to the SMS.

The picture is even more gloomy, if we are looking at proximity transactions, like buying something from a vending machine, or paying at a tollbooth. The idea of circumventing the mobile network, saving time and money and doing direct communication instead, between the handset and the sales device is nice, but presently is not easily manageable in real life situation. There are only a limited number of handset types that support proximity communication. Even these handsets use different channels either IrDA or Bluetooth. Although IrDA and Bluetooth are standardized communication solutions and have built-in applications, the actual models hardly ever follow the full standards making some of the handset types incapable of performing new type of transactions. With these types of proximity communication enabled devices we face the same problem what we have encountered in case of JAVA using SMS. Also in practice there are no JAVA phones on the market that are capable of accessing these peripheries via a universal way. In lack of the necessary APIs there is no other choice then referring again back to the SIM card for proximity transactions. Although IrDA and Bluetooth are available on the market, it is seen already that none of these means will prevail, but most probably some kind of RFID might be used for the purpose.

Presently prevailing communication methods are too slow, unreliable, and expensive for general purpose mobile commerce. Most available handsets are primarily – obviously – designed for voice communication and provide limited support of all other commercial services. This is expected to change in the coming years. Having said that, we should note however that there are today several efforts mainly in Asia that use IrDA for realizing proximity transactions.

2.4   Security related concerns

Security, trust and privacy have been identified as critical enablers for the success of mBusiness by many European Union funded roadmap projects such as PAMPAS [2] and MB-net [3]. In the modern era people cannot rely on face-to-face communication, on knowing each other, when doing business. This is even more true in case of mobile commerce. Potential business partners cannot even identify each other, not to mention more in depth knowledge of each other's preferences, track record, and business ethics. Presently there isn't any support mechanism available either that could assist orientation, preparation for conducting trade or business with unknown partners. In this uncertain environment mistrust and doubtfulness is an obvious reaction from any side of a business relationship, which calls for increased security measures in any form available. The problem is that the required security solutions presently are not generally available. They are either difficult to get access to, are too expensive, or are limiting the variety and partner circle of the potential transactions. It is noticeable that business partners might need more protection than what is currently available.

While most customers are familiar with using card services in the physical – buyer present – transactions many are reluctant to provide their card details to unknown trade partners. This mistrust is well founded, supported by the relatively high fraud rate of these transactions. Merchants are also reluctant accepting cards for mobile transactions. Besides the high commission levels reflecting the increased risk levels, they are the one, who risk being paid by invalid or faked cards.

As cash payment would be antagonistic, and completely unfit with mobile commerce there are no traditional solutions left that could facilitate mobile commerce. This situation calls for new approaches, satisfying the specifics of mobile commerce. It means that either new payment methods are required – matching the criteria established in the previous sections – or improved security solutions need to be implemented.

If partners cannot meet face to face they would at least like to get a confirmation from a trusted party that their commercial partner is really the one that he claims to be. Such assurance could be provided by using digital certificates on a general bases, but due to cost considerations and logistical issues such services are only available for a limited number of users. Besides actually being cheated, customers are more and more worried about loosing sensitive personal information, data that later can be misused. Present security solutions are not always providing the expected level of protection leaving the customers at risk and letting them no other choice but refraining from mobile commerce. The lack of adequate security measures is due to a number of factors, from plain negligence through high expenses, up to real technical difficulties.

Presently mobile commerce and especially mobile payment is not supported with adequate security, trust and privacy solutions or the applied methods are so expensive and cumbersome to use that are preventing users from conducting transactions. However, Identity Management efforts are ongoing for the Internet community and several standardization consortia such as Radicchio (www.radicchio.org) and Liberty Alliance (www.projectliberty.org) work towards federated identity in virtual world. If such efforts are successful, they will have a catalytic effect on mobile payment domain, as they will provide a homogeneous identity framework capable of bridging universally the real and the virtual world.

2.5   Lack of appropriate business models

Mobile commerce will proliferate only if it makes financial sense to all parties involved. It should be affordable for the customers, it should charge the merchants with reasonable commission levels and should provide satisfactory returns for the service providers. Presently only customers can be satisfied, as in most cases they pay affordable prices for the available products and services, and there are no high transaction costs – at least explicitly – associated with the trade they make. Merchants can be less pleased with prevailing market conditions, as their charges in many cases are higher than on other transaction channels. As mobile commerce presently practically refers exclusively to sale of digital content high commission levels can be tolerated. Due to the high levels of commissions, payment processor are making satisfactory revenues compared to what could be expected from the limited transaction numbers and low turnover figures. The key issue however is how to move forward; how to trade other products and services that cannot absorb the high additional charges. Presently there is no answer to this question.

MNOs who traditionally are the payment processors for digital content could not come up with satisfactory revenue models. As physical products and many of the services fit for mobile commerce cannot be economically transacted with high sale commissions the MNOs lost interest in promoting such items. There is just not enough room on these deals that would make it attractive for the operators. What would be acceptable for the merchant is far too little for the operators. In providing payment services for more traditional, higher value products, there is also the consideration of MNOs competing with banks as well as the fact that MNOs lack the necessary expertise for such activities. It is also important that in many countries there are legal limitations preventing MNOs from being active in high value payment processing.

Card services traditionally do not deal with transactions below 5 EUR for economic reasons. Many of the typical mobile commerce items, and deals would fall into this category. It means that beside the security concerns of the users, card schemes are also practicing self-restriction in being used for mobile commerce transactions. Third party payment providers can always establish themselves as niche players for certain product types, transaction types or users, but their economics of operation will not substantially influence the general mobile commerce picture and its economics. As banks are not active players yet in mobile commerce there is no business model based on their activity yet, that could be evaluated.

All actors must realize that new business models must come to the play. Mobile payment will create a homogeneous e-and m-Commerce marketplace with a unique underlying structure that represents an

amalgam of economic and social forces that managers must fully understand [4]. The new models will need to take into account the needs of the actors and the requirements such a global payment service in a unified commerce arena poses. Presently there are no service providers on the market, who could offer acceptable conditions to customers and merchants and still achieve satisfactory returns.

3.   General development tendencies

Mobile communication is a dynamically developing industry, which means that present unfriendly conditions for mobile commerce should not necessarily remain unchanged for a longer period of time. Changes and developments are happening simultaneously on several fronts. Both commercial and technical tendencies carry the promise that in the not very distant future mobile commerce will meet a much more favorable environment than what presently exists. Development tendencies are however not unambiguous for all players involved. For some factors, like future technical development, forecasts are relatively simple and straightforward. In case of other issues like evolution of the business relationship and interaction between the various parties, the future is far more unpredictable and vague.
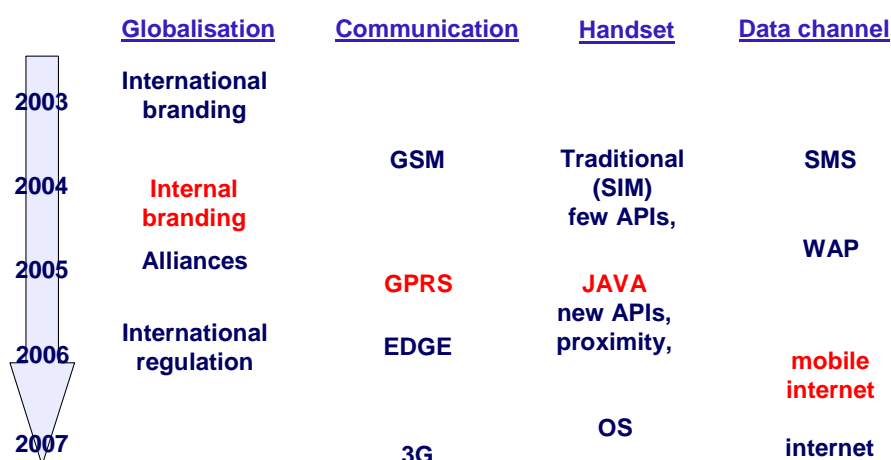
	Globalisation	Communication	Handset	Data channel
2003	International branding			
2004	Internal branding	GSM	Traditional (SIM) few APIs,	SMS
2005	Alliances	GPRS	JAVA new APIs, proximity,	WAP
2006	International regulation	EDGE		mobile internet
2007		3G	OS	internet

Figure 1 - Main aspects of development in the mobile communication industry

In the following sections we draw up our version on some future developments. We picture the tendencies as we see it, as we find it logically sound from a purely business driven perspective.

3.1   Technical development

A lot has been done already, but still there is much to do on the technology frontier to prepare for mobile mass commerce. The tasks are known but the important factor is, who will take the lead, who has real interest in preparing the necessary conditions for enabling mobile commerce and mobile payment.

Theoretically MNOs should take the lead, as they are in direct contact with the users and they are the ones having direct influence on the development of the communication infrastructure and the handsets themselves.

There is however a major conflict between the tactical goals and the strategic objectives, the short term profit targets and the long term commercial interests, the known present and the unpredictable future results of the MNOs.

MNOs are enjoying full control of the mobile communication market and are making good margins using their existing infrastructure. Their primary tactical goal is to maintain this situation as long as possible; to freeze the status quo.

MNOs – at least in the GSM world - have full control of all the services of the mobile networks, thanks to the SIM card in the mobile phones. This control provides MNOs with unmatched market

strength and pricing power. The proliferation of Virtual MNOs[1] as well as advanced devices (e.g. JAVA enabled devices, PDAs/Smartphones etc) will loosen this control, and provide more flexibility and freedom to other parties. As soon as applications can run independent from the SIM card, but still be accessed from mobile handsets, new service providers will appear with their own offering, resulting in instant competition with existing players. For the MNOs, the following dilemma holds true: to have an established, controlled but very limited, inflexible palette of value added services, or open the door and promote the new handset types, solutions, new services, resulting in a potentially huge market, but with less control, more competition, where the end result is hard to predict? The answer in a large part depends on how MNOs evaluate their chances of turning the SIM card into a real platform being able to compete with JAVA and OS based applications.

The improved communication infrastructure poses threats for the MNOs as well. There is not going to be a time again like today, where so much money can be made by extremely simple services like SMS. With the proliferation of GPRS, the cost of data communication will be a fraction of what it is today. This communication will not only be cheaper but better as well. The improved communication infrastructure will not only reduce unit revenues but will also contribute to loosing control of the market. The better and faster service on modern handsets will provide access for the users to the real Internet, who from that point on will optimize the use of the services. There will be real mobile services, which will be accessed mainly through mobile devices, but not exclusively. Such services will be accessed in a uniform way also from mobile phones, PDAs and PCs (either via wireless technologies or legacy fixed connection). This wide bandwidth and access to the Internet will again contribute to less control, but increased market opportunities, where the end effect is unclear yet.

The strategic goal of MNOs is definitively supporting changes and technical advances. No matter how good are the present operating conditions they are over their peak and are rapidly deteriorating. Competition is getting more and more intensive and the voice market is close to saturation. Operators cannot afford a "wait and see" attitude; they have to discover new revenue sources and new business lines. The revenue channel of the future will be data communication that is very closely tied to mobile commerce. The result is that MNOs need to technologically prepare for the future, a move that will eventually result in the right technical environment for mobile commerce.

Unquestionably the right conditions will be eventually established, however the timing when this will happen is hard to predict. The speed of changes will depend on two major factors: selective pricing and business models. MNOs need to be careful when introducing new technology and new services. If they manage to bring the novelty to the market in such a way that it does not deteriorate existing condition, does not provide direct competition to existing services, does not put downward pressure to existing pricing structure, then the introduction of new technology will be a targeted one, will concentrate on specific user groups and will be relatively fast. On the other hand if this fine line is not found, such separation is probably not possible and new services will encroach into present revenue flows. The strong effect of downward pricing pressure caused by the new technology will substantially slow down its penetration to the market.

The end results of the two scenarios will not be basically different. The first option will result in slow, but early penetration of new technology targeting first specific niche markets and user groups. The second outcome will result in a slow down of the technical development, but eventually bringing it to a revolutionary breakthrough. For new services and revenue channels the first option is more favorable, as they could be tested and introduced gradually for selected market niches and by the time the mass market is ready, the services would already be capable of satisfying all the requirements.

The choice of development strategy is influenced by the appearance of new business models as well. The fact that legacy technology and voice is generating better returns and higher margins at the moment than what is expected from the new infrastructure and new services does not mean that this situation is an eternal fact. As soon as new business models are elaborated that justify early adoption of new services and technology, the financial incentive will be there to accelerate development efforts and deployment. Voice technology is still the killer application for current mobile networks, however this will change and data services will takeover this title.

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[1] A Virtual MNO is a network operator without a physical network but with the ability to switch his own traffic and to issue his own USIM/SIM cards

There is one more important factor that was not considered so far, which is the arrival of 3G and beyond infrastructure. This technology is here and provides new services and capabilities in the network and not simply more bandwidth. Especially the UMTS licenses were expensively acquired, so the mobile network operators will make anything possible to promote and make the UMTS story a success. This implies that within the near future, such an advanced infrastructure will be the common denominator for any service and advanced mobile end-devices will accompany it. This is still unclear for many at the moment, however if this happens at a more rapid rate, the mobile commerce area will drastically change. Therefore new mobile payment approaches should consider as a common denominator not the existing limiting infrastructures but the ones that will be widely available within the next two to five years.

3.2   New payment service

Part of the reason mobile commerce is practically non-existent is that there are no real universal payment services available on the market. The appearance of such a service would contribute to establishing the necessary conditions for unleashing the real potential of mobile commerce. The new service will provide the necessary link between huge masses of customers and most merchants active on the market. The service will be a combination of existing solutions and the application of new technology. Up to now experience has proven that existing services are inadequate for this purpose, but completely new – out of this world – solutions would have too deal with a long learning curve and too high entry barriers. The new service will most probably be provided by existing service partners, who already enjoy the trust of customers and merchants. The obvious right parties would be banks, who inherently posses the trust of their clients, and who have all the experience and infrastructure to operate the service. Besides banks, mobile network operators can also play a significant role, due to their huge customer base, their transaction processing capabilities and the perception of the mobile handset being a personal trusted device.

The service will need to be an open one as no party alone can generate the satisfactory transaction volume that is a precondition of a successful payment service. Competing services may initially appear on the market but as the network effect is the most important criterion for such a service eventually a maximum of a couple of services will survive. The prevailing payment services will be of universal character, suitable for supporting any payment transactions for any services, in any value, between any parties, everywhere and any time. To be generally accepted, the service needs to be flexible, user friendly and by all means secure and trusted. As the technology available for the users – handset, communication, etc, - is not uniform the solution should be able to bridge this barrier and provide access to the service for everyone irrespective of the technical capabilities of the individual e.g. a basic handset with SMS function, should just as well fit the purpose, as a PDA over 3G. On the other hand to ensure the necessary speed, reliability and security the most modern solutions and inventions need to be applied.

A major barrier for the development of mobile commerce was so far the luck of a solid business model. The new payment service should give the right answer to this issue. Pricing of the service should be affordable to both merchants and customers but should at the same time assure satisfactory returns for the service providers. The problem is known the solution was not found earlier.

The above described criteria mix however guides us to the right direction. As the new service will allow all kinds of payments between large user bases, the transaction volumes are going to be maximized. This large revenue potential is paired with a favorable cost structure. There will be no need for special systems for the various transaction types, as the service will handle everything while it is using the same infrastructure with optimized communication. The applied security solutions further contribute to the improved economics reducing security and fraud related expenses.

3.3   Broadening of mobile commerce - new transaction types

The future mobile commerce landscape will soon look a whole different than it does today. The scope of potential transactions is much greater than what we anticipate today. Digital content will not be the only product type that is fit for mobile commerce and will not even be the most important one. It must be clearly seen that for certain transaction types practically all conditions are set, therefore these could already be started today. For others, some form of development – commercial, technical, logistical,

financial – is still needed. It is very important to start promoting and introducing only those transactions of mobile commerce, where all involved players can get instant satisfaction and real benefits and introduce the other ones only when their operational requirements are fully met. In this way dissatisfaction can be minimized, and the uptake of mobile commerce will be a continuously broadening activity including more and more transactions, products and service types and involving more and more customers and merchants.
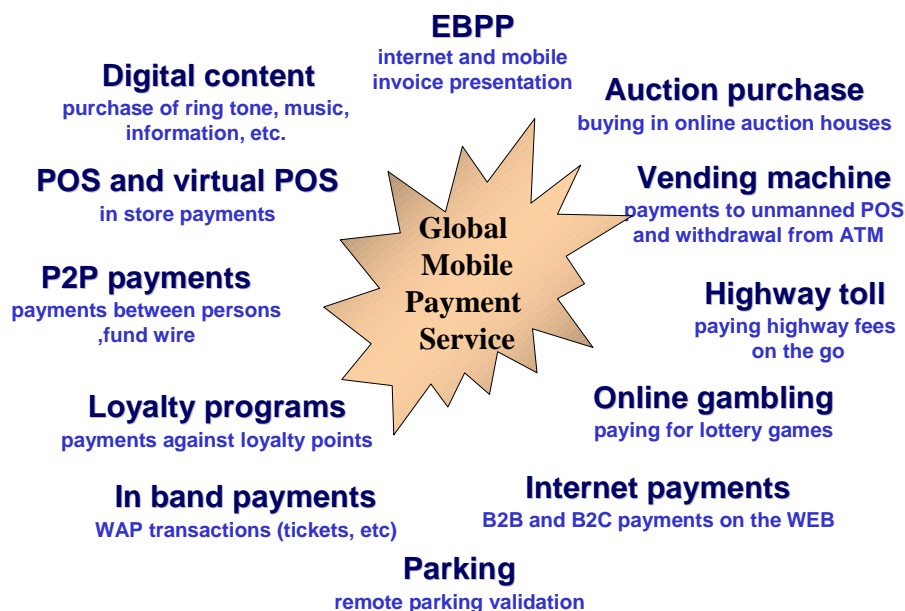
EBPP
internet and mobile
invoice presentation

Digital content
purchase of ring tone, music,
information, etc.

Auction purchase
buying in online auction houses

POS and virtual POS
in store payments

Vending machine
payments to unmanned POS
and withdrawal from ATM

**Global
Mobile
Payment
Service**

P2P payments
payments between persons
,fund wire

Highway toll
paying highway fees
on the go

Loyalty programs
payments against loyalty points

Online gambling
paying for lottery games

In band payments
WAP transactions (tickets, etc)

Internet payments
B2B and B2C payments on the WEB

Parking
remote parking validation

Figure 2 - The future e-/m-Commerce transactions

People in the mobile communication industry do not tend to be talking about killer applications any longer, but probably there are still such use cases. One of the candidates for such a title (besides mobile payment as described above) is mobile parking. There is huge potential in mobile parking but only if generally applicable solutions are replacing the presently available local initiatives. The entry barrier needs to be minimized, the solution needs to be convenient and user friendly, and access to the service needs to be provided to the widest possible user base, not just to clients of one MNO, or prepaid account holders of a parking company. In an ideal world even a foreigner should be able to make use of mobile parking in any city. Under the right circumstances – service structure, communication infrastructure, handset design, pricing – mobile parking would provide convenience and savings for the users (less penalty fees) and increased revenues for the parking companies (more car owners paying for parking). As the service would provide real tangible benefits for all the parties, and not just the mobile hype (let's pay with the mobile; it is cool), a huge user base will be gradually developed. Due to the fact that parking is a frequent, repeated transaction type, it would result in large transaction numbers and associated communication fees for the MNOs. This is what used to be called "killer application".

A similar simple transaction type, with high customer appeal and real tangible benefits could also be remote ticket purchasing. There are a number of ways how the actual transaction can be performed; the critical point is that it should provide convenience to the user. Be it ticket purchase for transportation, or for an event, avoiding lines and waiting is a definitive plus for the users.

Mobile parking and ticket purchase should not be evaluated as standalone approaches, which in some limited form exist also today, but in a network concept. Mobile commerce will flourish, when users have easy access to products and services, can make simple payments and if they get familiar with the whole transaction process. Familiarization should take place only once and then all the processes should be identical (or at least very similar) irrespective of the fact what the subject of the trade is, what the actual commercial situation is. This is why it is so important that mobile payment gets one universal solution. With this approach such basic services like mobile parking, and ticket purchase can assist the take up of

other transaction types as well. If users try buying something with a mobile they need to be satisfied with the trade to repeat the process. For this basic introduction the most general and simple, relatively low cost transactions are the most suitable ones. If the first interaction was considered to be a success, or at least not deterrent, then repeat actions can be expected for the same products and services. As soon as this type of purchase becomes a habit, a familiar type of action, users will venture into other territories, into other purchases with the same known mobile payment procedures.

The process will look like a traditional learning curve. First try a transaction with minimal risk, one that is completely regular and low cost. If the first trial was all right, repeat it as long as it becomes the "normal" way of doing business. If already confident with it, try another, a less obvious one but still with low value. As long as the experience is positive and confidence increases, new transactions with higher and higher values will be tried as well. The so called early adopters will be the first ones trying the new service, but as they will use it frequently, in various forms and situations, their experience will slowly convince also others about the advantages of mobile commerce.

So, what other services could follow suit after the initial introductory ones? Mobile phones could be used for purchasing of a variety of products and services not just tickets. This is like e-commerce on a mobile channel. Books, software, travel, etc, could be great candidates for this transaction type. The cost of these merchandises could range from a couple of euros to hundreds and thousands of euros.

Toping up prepaid accounts – primarily mobile accounts – is going to be a major, very important transaction type. Nowadays most MNOs have far more prepaid customers than post paid ones. These customers all have access to handsets and need a convenient simple method to replenish their mobile accounts. There is no better way to pay for mobile service than actually using the mobile handset. With this approach there are no surprises; there is no downtime. If the MNOs are able to notify their clients that their balances are running low – it is an existing service – then users are able to initiate the top up instantaneously from their mobile phones. As payment is real time the service will not have to be suspended for any period of time, resulting in convenience for the users and higher communication revenues for the operators.

From topping up prepaid accounts it is just a small step to introduce account-to-account (A2A) or person-to-person (P2P) payments. There could be different levels for such a service from real time notification-authorization, to actual real time availability of funds. From A2A or P2P payment there is a direct road to use mobile handsets like virtual POS terminals. In this scenario both customers and merchants use the mobile device as their sales and payment tool.

Mobile bill delivery and payment is another obvious candidate. Receiving the different utility invoices in the form of SMS messages onto the handset gives great control and convenience to users of the service. Customers may decide to pay or not to and can even define the timing of the payment. Utility companies on the other side receive a relatively inexpensive (compared with regular billing costs) and direct way of communicating with their customers and can also realize savings by avoiding printing and postage expenses related to the regular invoicing process. This service can even be connected with regular EBPP procedures providing a variety of access channels and a real, all round solution, for both customers and merchants.

Many of the above transaction types, use cases could take various forms of performance and processes. The basic difference is however not in the way the transaction is designed, but whether the parties are interacting remotely or directly (proximity). Apart from the remote transaction types, the proximity ones need to be handled too. Proximity transactions have the benefits of avoiding public communication networks, resulting in increased speed, security and reduced expenses. The communication can be realized over IrDA, Bluetooth or RFID. These transaction types, like purchases from vending machines and making payments at POS terminals, could soon be very popular and used by large customer numbers, but the present technical environment is not supporting the mass take up of such interactions.

There are also various transaction types, like paying with mobiles for regular products in brick and mortar stores, which are possible, but do not really generate any benefits either for customers or merchants (at this point we are not talking about mobile commerce any longer, this time the analysis concentrates on mobile payment.) It has to be seen that many of the mobile payment transactions do not make sense – neither from usability nor from financial perspectives – if they are applied in the traditional commercial environment. The commercial potential however of these transaction types is huge if they

are used in the right context, with the right conditions. Right environment means that the whole sales process, the overall logistic, needs to be redesigned or changed in order to unleash the real potential of mobile interaction.

It is hard to see any benefits in paying with a mobile phone to a cashier at a check out counter, but the real benefits become obvious as soon as customers select the products in the store, receive the price details onto their mobiles, are paying for the products using their handsets and if they wish to, they can avoid any interaction with the sales personal including waiting in lines in front of the check out counters. This scenario indicates that it is not enough to evaluate mobile transactions and payment scenarios in a static way but the dynamics of the whole transaction, the potential improvements in the logistical value chain need to be evaluated to get the full scope of potential benefits to be realized by using electronic channels. The conclusion is that there is room for mobile commerce in a much wider scope than what we experience today.

3.4 Changes in market forces

What we will experience in the future is what has also been mentioned before in this paper. Mobile payments are not targeting the mobile commerce arena but the traditional Internet commerce (eCommerce) one also. Figure 2 depicts the different potential transaction types, including the ones that are traditionally considered electronic – Internet – transactions. It is simple to prove that eventually there is not going to be mobile commerce and Internet commerce, but universal/global electronic commerce (e.g. uCommerce / gCommerce), to be accessed from various channels, mobile and Internet. This is going to be one homogenous market. The question is not if, but when. These changes are purely technology driven and therefore the speed of convergence will depend on the factors already analyzed.

Mobile commerce in itself would only make sense if it had such differentiating specifics that would justify separate treatment. However even if such specifics may presently exist compared to electronic commerce, these will completely disappear over the next couple of years. The result of technical development, the arrival of broadband mobile communication (GPRS is already fit for the purpose and 3G and beyond technologies will close the gap), the improved handsets – better screens, JAVA capability, OS based applications – will result in the complete convergence between mobile and electronic commerce. The end effect is that there will be electronic commerce, which can be accessed either from fixed lines using a PC or wireless using a mobile phone, a PDA or even a PC.

Having considered the above thoughts, if there is one market there is one type of trade on that market. If there is one market there should be one market model. It is hard, if not impossible to justify why people would pay different prices for a product just by using different devices e.g. PC, mobile handset. It is even more difficult to explain, why a merchant would pay different commission levels to anyone, just because its customers are using a different device. The merchant may not even be aware of the fact whether the buyer is using a PC or a mobile telephone.

If there is one market model the question is which one, the m-Commerce, or e-Commerce will prevail? Most probably none of them, but a hybrid form i.e. a composition of the two.

It will be impossible to maintain the excessive commission levels – running up to 60% of transaction price - charged by the operators for digital content. Such approaches will not survive in the long run as merchants will be reluctant to pay these fees as soon as they have alternative solutions. The alternative channel will be – or is – the Internet, which poses another extreme i.e. free access to similar services. The result is that sooner or later – depends only on the speed of technical development, as stated earlier – the high sales commissions of m-commerce will be reduced to more reasonable levels, but also the free access to products or services on the Internet may have an end as well.

Also if we are talking about electronic trade as such and not about specific transaction types it is not possible to maintain extreme commission levels on a selected category of products, while applying more normal conditions on others. The limits are not flexible at all. The real tangible products cannot tolerate much different sales conditions from the ones they are used to in the physical world. If such products are sold within an established commercial environment, with known sales conditions and business model, then it will orientate all other sales activities even on electronic channels. The high fees are also contradicting to all economic sense and are very much resembling to a situation, where monopolistic pressure is used against commercial partners. The result will be that as soon as the level of trade reaches some real substantial value, regulators will take a deeper look of the commercial and financial conditions

of these types of transactions and if market forces could not properly shape trade conditions, then regulators will do it.

If there is going to be one unified electronic market, a unified business model and close coexistence between the digital and physical world, why should not be a payment service available that can be used in both environments, for any products, on any channels? Such service could very much benefit from the network effect, universality, and the general desire to have a unified solution. However the scenario in the physical world is basically different from that of on electronic channels. While in the digital domain there is no established payment solution, there is no service that could claim general acceptance, or applicability, in the physical world there are well-established existing solutions.

In spite of the existing solutions in the physical world, potential benefits of integrated commerce and payment services are so great that it is possible to establish a general payment service that can be used for mobile and Internet transactions but also for payments in the traditional brick and mortar environment. The only precondition for the success of such a service is that it will have to add real value. No customers – or only a very few ones, and only temporarily - will use their mobile phones or PDAs to make payments if it does not provide real benefit for them. Just the mobile feeling is not enough. But if this payment solution is more reliable, quick, secure, and more convenient than existing services then such a service has the potential to be the universal application for the next era.

The future will be a homogeneous electronic commerce market, with homogenous (or similar) business models, with access channels through the Internet and mobile devices. The single market will have a real time universal payment service that can eventually be used in physical transactions. The new development tendencies depicted above - the technical advances, more transaction types and related network effect, the emergence of uniform electronic commerce, the introduction of a universal payment service - create the necessary environment for a business climate, where it makes real sense for a number of different players to conduct commerce on electronic channels and to actively contribute and participate in this activity.

Seemingly electronic commerce depends primarily on the merchants. They are the ones who can bring new products and services to market. As soon as merchants are facing effective demand, with related purchasing power and commercial conditions that provide satisfactory returns, a robust flush of new merchandize and services will appear on the market. For merchants there is a precondition for generating the new sources of supply: it is the effective demand. Customers need to have the capability to conduct electronic trade, and need to have the means to pay for the selected goods. The technological advances will enable the buyers to transact electronically and the new payment service will allow them to make payments for the transactions. The only missing conditions that need to be established are those of economically sensible terms of performing these purchases.

As it turns out, both merchants and customers and their behavior, eventually the future of electronic commerce, depend on the activities and strategy of those actors, who are facilitating the trading relations and providing the payment solutions. These parties are primarily financial service companies (banks) and MNOs.

On the one hand banks are the ones, who could be the driving force behind turning electronic commerce from wishful thinking into reality. They are the ones, who can generate new transaction revenues, who can replace older expensive payment types with new more profitable ones. It is in their inherent interest to lift this market from practically nothing into a real commercial activity. Banks are the ones, who, from among all parties involved, could make the most benefit from electronic commerce.

Banks are the ones who not only have access to merchants and customers but also already possess much of the necessary infrastructure. Providing the new sales channels for the merchants and more payment options to customers is the task of the banks. If they do their job right it will result in increased activities for them. If banks can leverage existing infrastructure with new activities this would not only generate new revenues but optimize economics of operation and reduce expenses. The banks are the ones, who based on their expertise can elaborate the necessary business model that would satisfy all players. With electronic commerce, banks have a relatively easy situation, when a new business model needs to be introduced. The calculation can be relatively straight forward because they need only to take into account expenses and potential revenues. As electronic commerce is practically at its birth and no real substantial established services and revenue channels exist yet, banks do not have to worry too much about cannibalizing existing revenue channels of other service lines.

To give a kick-start to electronic and mobile commerce, banks do not have to do anything else but to offer those same conditions for both buyers and merchants that they are traditionally used to in the physical world. Providing uniform terms on all the channels, will result in quick take up from the user side and more importantly it will generate improved returns for the banks, as the cost structure of the new sales channels is much more favorable than that of the traditional ones.

Banks are key players in electronic commerce but to go alone would take too much time. The obvious partners are the mobile network operators. So far, members of these two industries were fiercely competing for ruling mobile commerce, however that definition of mobile commerce was a lot narrower than the one presently described. The cooperation of banks and MNOs can open new perspective for electronic commerce.

MNOs can very much influence the speed of the technology changes, necessary for mainstream mobile commerce. They need the financial incentive to actively promote these changes and participate in the dissemination of the new technology to their huge client base. MNOs need to see that mobile commerce will result in increased communication revenues and that they can also have a share from the transaction processing. MNOs are infrastructure providers so their primary business is generating communication revenues. This commitment may lead MNOs to establish a pricing structure that would be prohibitively expensive for many of the projected transactions types. High communication charges would practically price out these new services from the market, with the result of not generating any revenues at all. MNOs need to see that by providing reasonable price levels they generate extra communication and also related revenues from the financial transactions. These two revenue sources combined may even result in higher earnings than what could otherwise be generated from just the communication activities even with higher fee levels.

MNOs could even take a more active part in the financial transaction processing, if country-specific legal framework allows it. They could be processing low value payment transactions against the accounts – pre or post paid is irrelevant - of their clients. As these transactions are not specifically favored by the banks – too expensive for them – and do not require sophisticated financial expertise either, it is a perfect opportunity for real cooperation between banks and MNOs. In this division of work both parties would gain and none of them have to sacrifice any important goals or objectives. MNOs can further participate in the actual transaction processing on the merchant side too. Besides offering access for their sellers to a large clientele, they also can process incoming revenues on behalf of their merchant partners. Small value payment processing on merchant side is just as much expensive as on the customer side with the traditional financial infrastructure, therefore most banks welcome the contribution of MNOs in this activity.

It is obvious that based on the cooperation and shared interest of the banks and MNOs it is perfectly possible to elaborate such a business model that is satisfactory to all parties involved, and which is capable of supporting the early introduction and fast growth of a full fledged electronic commerce activity.

4. The SEMOPS solution

We have presented our views on the mobile payment arena from different angles. However, just talking about something is not backing up the opinions that are depicted in this paper. Therefore, we will refer to SEMOPS, a mobile payment service that has actually been implemented as a European Union project and has recently been presented in CEBIT 2004. We are now in a continues process of enhancing the service and deploying it at different mobile network operators and banks in order to get real world experience and also back up our views about the future mobile payment domain. SEMOPS was developed with the aim to address effectively most of the matters mentioned in this paper, and develop an open, cross-border secure service. It has fifteen participants from four countries and is based on the cooperation of banks and international MNOs. The service concept is built on the credit push concept and all transactions depicted in Figure 2 can be realized. In Figure 3 the general model of SEMOPS can be seen.
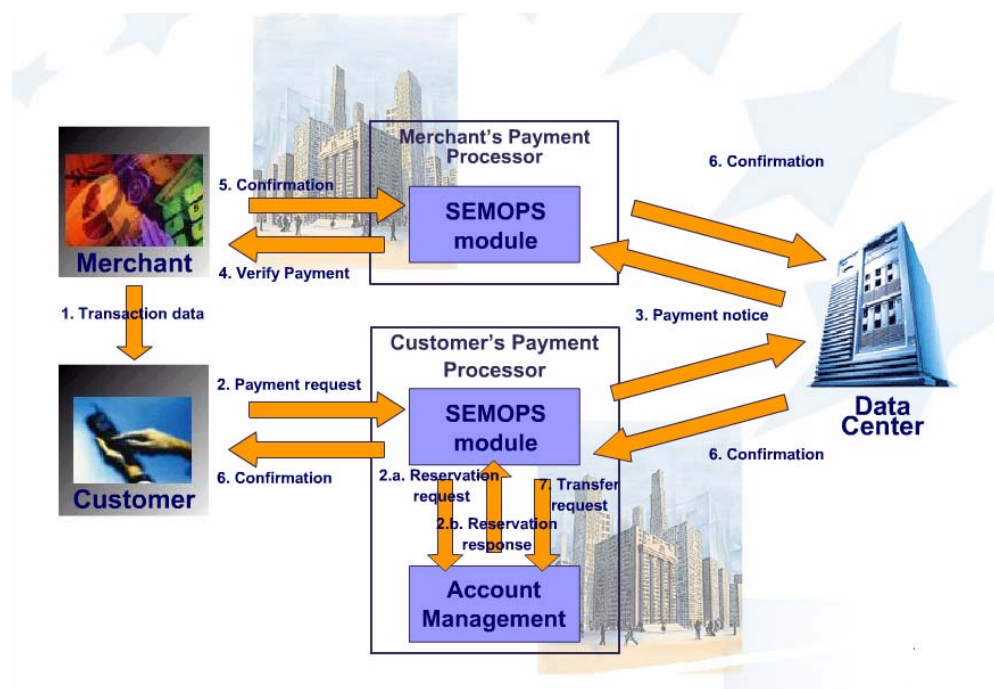
Figure 3 - SEMOPS Transaction Architecture

SEMOPS features an innovative architecture [5] and a new business model [6] that depends on the cooperation of the banks and MNOs as well as the social existing trust [8] of the users in these institutes. In SEMOPS each user (customer or merchant) interacts with his payment processor e.g. home bank or mobile network operator only. Therefore, the users trust their bank or MNO who can timely provide information and manage the transactions on their behalf, and they do not need to trust the transacting party. The banks use their existing trust relationships among them. The banks and MNOs can exchange messages between them via the Data Center (DC). We should mention that the legacy systems of the bank and the merchant are integrated in the SEMOPS infrastructure and are used as usual. In [1] a detailed analysis of this approach and its potential is depicted.

5.   Conclusions

We have presented our views primarily on the relationship between mobile payments and mobile commerce as well as the mobile payment significance for e-Commerce. The current market situation is not what it was predicted, and this is due to the barriers that exist on the business side but also on the technology domain as well. However we are optimistic that these barriers will cease to exist in the future, when everybody realizes that the way is common and a global payment solution that will satisfy the actors' requirements will make e- and m-commerce flourish. We have presented our views on some areas that should be closely looked when designing such a service not only from the technology point of view but from the business side as well, since problems like trust management can be successfully tackled there and the technology part can focus on security. It is clear that a cooperation of banks and MNOs is the way to go. SEMOPS is a payment service that has been implemented and has taken into advantage the directions proposed in this paper. We consider that the future belongs to SEMOPS-like approaches that promote openness, cooperation, are decentralized and can use state of the art technology to fulfill their procedures in an efficient way.

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