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### Reconsidering the Challenges of mPayments: A Roadmap to Plotting the Potential of the Future mCommerce Market

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#### Abstract

*The current market penetration of mobile phones in conjunction with an expected growth of mCommerce offers a high potential for the growth of mPayment over the next few years. Research analysts have predicted that mPayments will gain a significant foothold in coming years although high-speed data services and the requisite demand will not materialize overnight. A wide variety of mPayment technologies are available today, but the value of such services is not clear.*

*Services launched have seen both success and failure and therefore service providers need a realistic vision of the future. This paper explores the factors that affect the growth of the mPayments market and attempts to provide a roadmap for reassessing the potential success of this future market.*

#### 1. Introduction

The concept of mobile commerce came into existence around the mid 1990's, which resulted in optimistic forecasting that by the year 2000, mobile commerce transactions would occur on a daily basis. With great sums of money being exchanged for UMTS licenses (3G) across Europe, early 2000 further experienced great confidence in the future of the mobile communications. The promised technological outcomes however did not live up to prevailing expectation, which impacted on the ability of mobile network operators (MNOs) to deliver services. (Keen and Mackintosh 2001) observed that the next major shift in the use of IT will obviously be toward wireless and mobile commerce and it will happen with the same start-up problems encountered by eCommerce as in many ways mCommerce is the continuation of eCommerce with mobile devices.

With the growing momentum of the wireless revolution and the mCommerce explosion, it is evident that mobile devices are becoming a critical component of the digital economy. The spread of mobile phones bode well for the future of mCommerce. Most mobile phones have an embedded chip that can be used to store value or provide secure authorization and identification that does not rely on a card reader, PC and modem combination or a POS terminal. Therefore, some experts believe that the mobile phone will replace even smart cards as a means of payment (Bucci 2001; Henkel and Zimmermann 2001; Krueger 2001b).

Mobile phones have become devices for paying for merchandise (Paavalainen 2001) and as mobile markets continue to mature, the ability to pay using a mobile handset will be key for the development of next generation services. (OSCIE 2002) suggest that the widespread access to payment services on mobile phones and mobile communications devices is in fact a pre-condition for the development of a successful marketplace for advanced mobile services in the European Union and that mPayments are likely to become an important segment of the retail payment market. To a large extent the reason lies in immediate payment fulfilment and thus reduced risk and transaction cost.

TowerGroup forecasts that the number of consumers using mobile devices to make payments will rise dramatically between now and 2005 and that 118 million Western European and 145 million users in the Asia-Pacific region will purchase low-cost mobile premium content by 2005 (Cellular News 2002). Forrester Research claims that the mobile payment market will be worth \$22 billion by 2005 making it the fastest growing area of the global payments scenario (Baschnonga 2002). (Wireless World Forum 2002a) predicts that Japan, USA, Germany and UK will represent four of the largest mobile payment markets in the world by 2006 and forecasts that there will be more than 200 million regular mobile payment users, spending a total of 47.2 billion Euros.

Despite the high level of expectation that prevailed in 2000 and 2001, no mPayment platform has as yet gained significant market acceptance, at least in Europe. Existing solutions are either available only in specific geographical areas or amongst a given set of market actors, or limited in the range of functionality they can offer. Current solutions are generally costly due to an absence of economies of scale. Therefore, there is no truly competitive offering on a pan-European basis, that includes a sufficient set of functionality (OSCIE 2002).

(Towergroup 2001) and (Fife 2002) suggested that mPayments will only begin to show significant adoption globally when the technical, social, and economic hurdles are overcome and consumer demand rises, though this will not take place in the immediate future. It is estimated that growth can be anticipated after 2006.

This paper attempts to provide an insight into the key challenges surrounding the mPayments environment, with a view to providing a framework for reassessing the future directions for a more successful market.

## **2. Methodological Framework**

The dynamic nature of the subject under study entailed an exploratory investigation mainly through synthesized data collection from secondary sources. Jarvenpaa (1991) and Neuman (1997) endorse this method of synthesizing and analyzing data that has been collected for other purposes thereby making inferences for exploratory research in Information Systems Research. Furthermore, as this is currently a dynamic subject, most of the information has been derived from conference presentations, white papers, panel reports, ongoing research working papers and also some recent publications.

The main driver of our research is the relative lack of synthesised empirical documentation in the area of mPayments and the dynamic nature of the subject under study. Gavana et al (2001) recommends the use of an exploratory investigation when there is relatively less information about particular situations or when there are no precedents available to extrapolate from. Therefore, being a new and evolving discipline, mPayment Research suited this procedure. Exploratory studies are also crucial for getting insights into new phenomena and for advancement of knowledge to utilize further methods.

### **3. Key Challenges to a Successful mPayment**

Presently, there are a great variety of mPayment technologies available globally, but significant adoption of such services is yet to come. Services launched so far have seen success and failure with probably more of the latter. There have been a number of third party micro payment schemes (for e.g. Cybercash, Digicash, Flooz, Beenz.com etc) that have been implemented for payments via the internet as well as the evolution of mPayment services (e.g. Paybox) but these are gradually disappearing.

In 2001, Forrester Research identified three major issues that prevented mPayments from taking off; lack of consumer trust, partnerships struggling over the terms of their collaboration and a lack of standardized user-friendly infrastructure. Others, however, attributed the reasons for this slow start to device and network limitations, maturity of payment solutions, customers' lack of interest and the lack of common standards.

On the other hand, many authors have suggested that key success elements include the combination of simplicity and usability of the services, cost effectiveness, market knowledge and understanding, teaming up with the right partners, security and technical interoperability (Bennett 2002; Northstream 2002; Trintech 2002). In addition, (Wireless World Forum 2002b) suggested positioning payments as a core element supporting the mobile internet strategy and developing payments systems to be as usable as possible for the consumer. Lastly, this should also provide a realistic business case for all involved.

(Northstream 2002) argued that a critical mass is needed on both ends of the mPayments chain to make it a success, where it is essentially about buyers who need to choose mPayments as a form of payment over what they currently use; and about merchants who are ready and willing to accept this new form of payment. (Fife 2002) suggested that customer behaviour modification and shifting of activities to use mobile technologies can occur only if all of the pieces of the value chain are coordinated. In order to obtain a realistic vision of the future, service providers need to pay careful attention to social and cultural factors of a given location (Fife 2002). Analysts believe that a payment solution would need to rapidly reach most merchants to be acceptable to consumers, and be readily usable by more than 15% of consumers to be acceptable to merchants (Wallage 2002).

When Paybox announced the pullback of its mPayments services in January 2003, it had approx. 700,000 active users and 7,500 acceptance points in Germany, with a total of 900,000 users over four countries (Wallage 2002). It was considered by many to be one of the more successful mPayment start-up companies (Donnelly 2002; Wallage 2002). This raises a question on "what is the right level of critical mass needed for an mPayments venture to succeed?"

In order to understand and answer this question, we have therefore considered the following dimensions:

### **3.1 Security**

The lack of security has been a major obstacle for the success of business to consumer eCommerce in the fixed line Internet environment (KPMG 2000b; MeT 2001; Baschnonga 2002). Secure payment standards are essential if mCommerce is to become a mass-market phenomenon. Key features for highly secure mCommerce include authentication, nonrepudiation, encryption, data integrity and confidentiality [see (Ding and Unnithan 2002) for details]. Surveys revealed that the most important barriers for consumer adoption of eCommerce were security, privacy of personal data and trust.

This theme seems to have continued into the mPayments environment. (Baschnonga 2002) highlighted that the evolution of payment services has been hampered by the absence of a ubiquitous security standard. (Hampe et al. 2000) however, disputed the security concern on mobile devices by arguing that digital mobile phone networks are encrypted, which ensures that messages cannot be added, deleted or modified. Mobile phones are linked to individuals and in the majority of cases mobile phone service providers already have an established system of identity checking. This sole ownership characteristic of the mobile phone, where the phone is uniquely identifiable and non anonymous, supports non-repudiation of transactions by customers, thus safeguarding the vendors (Hampe et al. 2000; Telecom Media Networks 2002; Trintech 2002). Additionally, the personal aspect of mobile phones enable secure certificates to be stored within the device and security of mCommerce can be developed to address current concerns. When mobile phones are equipped with a device to protect personal information, the security level of an entire service, including the network, improves considerably (Paavalainen 2001; Costello 2002; Ding and Unithan 2002; Trintech 2002). The authentication capabilities provided by the GSM/GPRS/UMTS system using SIM is thought to be sufficient enough (Hampe et al. 2000; Institute for Communications Research and Systems @ Work).

Companies like Visa International offers 3D-Secure technology to provide security for mPayment transactions that originates from mobile phones or other mobile devices. This allows Visa card issuers to validate the identity of their cardholders in real time (Cellular News Co 2002; VISA International 2002) leading to reduction in disputed transactions and the resultant expenses and losses. It is expected that nearly 80% of all eCommerce charge backs and fraud will be avoided (VISA International 2002).

However, as (Kalakota and Robinson 2001) and (Ghosh and Swaminatha 2001) have pointed out, the full potential of consumer and business applications cannot be realised unless there is a sufficient level of trust in the underlying security of mobile networks and end-to-end security provision is available. Consumer's lack of trust is a major barrier for the adoption of eCommerce and resolving security issues will not automatically help to gain this trust. It is of more importance however to convince and assure consumers about the security of mPayment systems which can be done with the assistance of proper marketing channels as well as advocacy from reputable institutions (Egger and Abrazhevich 2001; Telecom Media Networks 2002).

### **3.2 Interoperability**

Many claim that the most obvious obstacle in developing mPayments is the lack of common standards (Costello 2002; Ding and Unithan 2002; Northstream 2002). The current proliferation of payment software providers and their initiatives to implement and standardize procedures is actually hindering the progress of mPayments. This is because the lack of a coherent roadmap for the future may have lead to market fragmentation and delayed the growth phase (Northstream 2002; Datamonitor 2003). The lack of common

standards and a vast array of different solutions have served only to confuse consumers and consequently mPayments have failed to live up to expectations, particularly in Europe.

The usefulness of payment systems increases with the number of users. As users have a high preference for ubiquity, (Krueger 2001) argues that this demand for ubiquity will require interoperability and therefore a certain amount of standardization. Interoperability of handsets and systems is a major element in determining the success of mPayments (MeT 2001; Krueger 2001b) because ease of use and commonality of experience is key for the adoption of new technology. Standards and a Standards Body will help jump-start the mCommerce market.

In the past two years, several initiatives are underway to provide ubiquity of services, to push the development and acceptance of standards, protocols, and technologies for enabling such visions. MeT (Mobile electronic Transactions) formed by industry leaders Ericsson, Motorola, and Nokia, is defining the usage scenario and secure transaction architecture necessary to transform mobile phones into personal trusted devices. A Mobile Payment Forum has also been established by leading organisations in the payment industry to set up a global, cross-industry association to advance the development of standardized features and functions for secure and robust payment technologies in a mobile environment. PayCircle is also creating standards for the handling of transactions originating from mobile devices by creating standard interfaces through which payment systems, wireless networks and vendors will be able to communicate (Costello 2002). In Europe, the European Committee for Banking Standards (ECBS) and the European Telecommunications Standards Institute (ETSI) have signed a co-operation agreement to increase the effectiveness of their efforts towards the development of standards for the security of telecommunications and m-commerce (m-Travel.com 2002).

Early in 2002, the Open Mobile Alliance (OMA) was formed as the first steps towards wireless technology unification in its bid to devise open and interoperable standard industry needs to bridge the gaps amongst all the players. The association aims to deliver responsive and high-quality open standards and specifications for market and customer requirements that can be consolidated to create a common architecture. With the integration of many initiatives into OMA, we see this alliance as becoming the dominant driving force in the field.

### **3.3 *Simplicity and Usability***

Usability will largely determine whether users will use an mPayment service (Northstream 2002). A test conducted by Eye-square on Mobile Internet usability revealed that only user-friendly mobile services enjoy a high potential of user acceptance (Duda et al. 2002). Successful services are especially characterized by limited functionality and a clear focus on the specific mobile situation of the user. Services that provide a user-friendly navigation system and a quality application context have received the highest level of customer acceptance (Duda et al. 2002; Fife 2002; .

Customers make their consumption choices on the basis of benefits and values that technologies enable them to achieve (Kreyer et al. 2002; Northstream 2002). Providers of mPayments solutions must focus on the abilities of end-users to deliver mPayments as a service and position ongoing development with respect to consumer usage patterns (Wireless World Forum 2002b) as customer acceptance is vital for successful proliferation of mPayments. A study conducted by Cap Gemini Ernst & Young concludes that it is possible to speedup acceptance of new technology if operators focus their market strategy on the needs of the users and the product proposition consider what consumers want from an mPayments offering (Datamonitor 2003).

### **3.4 Market Knowledge and Understanding**

Building a brand and a mobile Internet strategy to focus on the ability of users to pay via their device was the cornerstone of success of I-mode in Japan (Wireless World Forum 2002a). However, (Northstream 2002) argued that the ability to use the mobile phone as a payment tool in itself might not be enough. Users and merchants should be able to perceive additional benefits such as reduced transaction time, reduced transaction cost, and also be able to address an existing need or solve a new (but real) problem. Current mPayments methods do not meet any of these parameters (Bennett 2002; Northstream 2002). Thus, despite their lack of security and convenience, payment methods are dominated by cash and cards simply because there is no better alternative (Ajay et al. 2002). Cash however has the benefit of providing anonymity, a feature not present in any other form of payment. As such, systems that wish to be sustainable must either improve their functionality and usability or aim to provide an alternative payment system where users and merchants perceive it as more beneficial than current payment methods.

In a study undertaken by the Electronic Payment Systems Observatory, (Böhle and Krueger 2001) claimed that "payment cultures" must be taken into account in order to give an interpretation of forces and factors that have an impact on the diffusion of Internet payment systems. There are clearly distinguishable payment cultures within Europe. Some of the payment options important in one group of countries are hardly used in others. The choice of Internet payment methods in a particular country largely depends on the payment habits at the real point of sale (Böhle and Krueger 2001).

(Northstream 2002) highlighted that cash is still used for about 80% of retail payments in western countries and in some cases this is still the only form of payment that is willingly acceptable. In the world of electronic transactions (namely the Internet), however, cash is almost non-existent, and credit cards are the most prominent payment method. Although other payment instruments have been around for many years, consumers' use of alternatives to cash is increasing slowly. Merchants tend not to rush into changing their habits, mainly due to related costs. Still payment instruments such as credit and debit are gaining acceptance. In Asia-Pacific for example, the credit market is expected to grow by 600% in the next ten years (Northstream 2002).

(Van Hove 2001) highlighted a separate study by Berlecon Research, which stated that new payment systems designed for the Internet are still hardly used in Germany. Even credit cards are not very popular in Germany compared to other countries as it is a high debit card usage country (European Cards Payment Review 2003). In the smaller online shops, the most popular means of payment is cash on delivery (COD) with no less than 40% of the total number of payments. Payment by means of a credit transfer after receipt of the goods ('Rechnung') is also popular (28%). Direct debit ('Lastschrift') is good for 13%; credit cards only come in fourth place (Van Hove 2001).

This is supported by another survey carried out by University Karlsruhe Germany, which according to (Böhle 2002), shows that even in the year 2002, the role of traditional payment systems to pay for online-orders has not decreased in Germany. German users still prefer to pay after receiving the bill or pay cash on delivery or pay by direct debit. Payment using mobile phones and prepaid systems ranked lowest. However, at the same time experience with new payment systems is also growing although the research results highlighted that curiosity was the main motivation for the use of mPayments (Böhle 2002).

In Thailand, very few web sites accept payment online even though the only online payment method available for Thai eCommerce merchants is that of accepting credit cards. This is because only 45% of the population owns a credit card in Thailand and that there is also a serious antipathy towards using credit cards online because of mistrust and

potential fraud. Consequently, online merchants have had to adopt a cash on delivery payment method using “7-11” (brand name) convenient stores as delivery outlets (Ekasdornkorn et al. 2002).

Therefore, instead of simply technological know how and advancement, a thorough market knowledge and analysis of specific differences are the key to minimising uncertainty and shaping the development of mPayments globally. Service providers will have to adapt their strategies according to local variations and payment cultures.

### **3.5 Right Partners/Competitors**

(Northstream 2002) sees the future mPayments market as one where players act together, each taking a fair piece of the pie. New players will enter the market and take some of the profits; mobile operators could possibly have a share of a market they haven't been a part of before and credit card companies could potentially have reduced profits due to the entrance of mobile operators (Durlacher Research 2001; Northstream 2002). Collaboration between key market players, including content providers, is essential to speed up development and time to market (Northstream 2002; Paybox 2003). The results of a survey in Norway, Denmark, Sweden, Holland and England have shown that the market does not explode before the content providers have access to around 70 - 80% of the mobile customers (Strand Consult 2002).

Many new initiatives that include various combinations of different types of players already exist in the mPayment market. Some mPayment services, like Germany based Paybox (now defunct) and Mobipay of Spain are independent (Van Hove 2001). Others, such as Vodafone m-pay bill, are operated by a specific operator only for its own subscribers. A key advantage of the independent players is that they enable every mobile user to use the service upon registration, regardless of their mobile service provider. For a specific merchant, teaming up with such a player is more efficient than teaming up with three or more separate mobile operators. On the other hand, an independent player will need to build a user base, usually from scratch. A mobile operator or a bank will already have millions of customers who are potential mPayment users (Northstream 2002). A clear definition of each actor's role is therefore necessary in order to ensure that the parties are complementary rather than in competition.

In particular, the key question of who manages the relationship with the customer and the merchant must be clarified (European Financial Management & Marketing Association 2003). It is likely that this exact argument is relevant in the Paybox case. While Paybox targeted primarily the end-users and declared themselves as offering a substitutional approach for credit cards, they didn't reach widespread merchant base (Müller 2003). A player must mobilize merchants with value propositions to include the ability to serve customers more quickly and cheaply, propagating declining costs as usage grows. The goal is to replace high cost payment methods as quickly as possible (Boston Consulting Group 2001).

In a specific market, an analysis should be done to identify the right balance required between players and what profit/risk distribution can and should be established. A more detailed selection process would identify the potential partners for the new venture. However, players must be prepared that some external factors might be involved (Northstream 2002).

The mPayment value chain is complex and it will take some time before different roles can be assigned to the best actors. For mobile data services to be successfully provided, careful coordination will be necessary to encompass the expertise of a variety of players (Fife 2002; European Financial Management & Marketing Association 2003). Table 1



below describes some strengths and weaknesses of different actors to act as Payment Service Providers or Trusted Third Party (Telecom Media Networks 2002).

**Table 1: Strengths and Weaknesses of mCommerce players (Taken from (Telecom Media Networks 2002))**

Criteria	Banks	Credit card firms	Mobile operators	Payment start-ups
Motivation	<i>Fear of staying behind</i>	<i>Add a new channel</i>	<i>New revenue and services</i>	<i>Business opportunities</i>
Mobile services skills	○	○	●	◐
Financial services skills	●	●	○	◐
Micro billing capabilities	◐	◐	●	●
Macro billing capabilities	●	●	○	◐
Large end-user base	●	●	●	◐
Large merchant base	◐	●	◐	◐
Move quickly	◐	○	◐	●
Able to expand quickly	◐	●	◐	◐
Sample company	SEB	Visa	Orange	Paybox



### 3.6 Cost Effectiveness

The main reason most companies promoting micropayments failed is because the margins on small value payments are very low and sufficient economies of scale is extremely difficult to attain. Perhaps most critical is the inherent openness of the Internet, combined with widespread provision of free services, making it difficult to convince consumers to take the trouble to pay for content (Trintech 2002).

Although we have some encounters of mPayment applications (for example, parking meters), our main consideration on explaining failures in the set-up of mPayment solutions are summarised in the following set of exploratory statements. Following our research approach as mentioned in section 2 above, we state what could later be transferred into hypotheses:

- Very high transaction costs;
- Insufficient value added in order to substitute alternative payment systems in existence, e.g. credit card via internet and services such as Paypal;
- The national or regional availability of systems. The unavailability of roaming contracts for most system which so far make traditional credit cards of superior value;
- Lack of trust in non-bank organisation offering mPayment system (Lack of well established institutional trust);

- The reduced marketing power due to capital shortage for start-up organisations offering mPayment solutions;
- Beyond early adopters, there might be initial barriers for non conventional schemes;
- For merchants, it's yet another system with 3% to 5% charge. mPayment is of low attraction as they would prefer the customers to use less costly payment methods anyhow;
- In the case of mobile solutions, mapping it to a bank transfer, the merchant is still left with revocation risks as mobile solutions that have been installed to-date have not reduced non payment risk associated to the current payment systems.

Cost efficiency is a crucial factor in the determination of success for the service provider. Visa International state that a minimum transaction value of 12 euros is needed, for a transaction to be cost efficient (Müller 2003). This should lead to a reconsideration of the long lasting discussion on micro versus macro payment where significantly lower thresholds had been considered. Furthermore, one might assume that a substantial proportion of current mPayment transactions (not only the Paybox case) are below 12 euros.

Visa actively markets new payment solutions to merchants in order to increase acceptance and offer a better value proposition. Taking into account that a worldwide merchant base is one of the most valuable assets for a credit card company, it may be concluded that their market entrance with new mPayment approaches will be by far the most promising option.

This argument achieves even greater weight, if one considers that Credit Card associations (like Visa, MasterCard) are closely linked to major financial institutions. Comparing that with new market entrants, like Paybox or others, who want to position themselves as intermediaries, the necessary investment required to set up a similar large merchant as well as user base, put that approach under serious question.

In addition, even if one takes the one hundred million subscribers of Vodafone worldwide, there are certainly other dimensions to consider, most importantly, trust and institutional brand. All the above-mentioned items formed a multi-dimensional space with complex inter-dependencies. Our discussion so far has mainly been based on general reasoning. However, to substantiate this general reasoning, we have to fall back on sound micro data. This will lead to an exploratory research, generating a set of hypotheses, but we have to admit that, that level of micro data is not accessible at the moment. As the market does not provide this data, we have to leave the empirical validation for further study (in case they become available).

#### **4. Conclusion and Outlook to Further Research**

mPayment is already in use in many parts of the world, including Europe and Asia, even though not significantly as yet. Taking the failures discussed so far (especially the case of Paybox), we still consider that we are in an early stage of an innovation process so we clearly expect the diffusion of mPayment to lie ahead. With the Asian markets showing an enormous take-off and the European market indicating a state of stagnation and towards decline, we conclude that our future research approach should be redirected to these emerging markets.

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