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## **A Comparison of Mobile Payment Procedures in Finnish and Chinese Markets**

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### **Abstract**

*Researchers are particularly interested in factors that affect the adoption, innovations and diffusion of mobile payment, which is a typical and wide application of ICTS (Information Communication Technology Services) in developed and developing countries. Though mobile payment is an exciting domain and rapidly evolved in recent years, the existence of standardized, interconnected and widely-accepted mobile payment procedures is crucial for successful diffusion of mobile payment and has mobile commerce globally, even in one country or region. In this paper we make a comparison of mobile payment procedures in the Finnish and the Chinese market. Current payment procedures can be categorized by using strategic, participatory and operational criteria, according to the morphological method. Based on these, we analyze the current constraints on the mobile payment procedures in the Finnish-Chinese market in order to make it clear whether we can develop a generally accepted mobile payment integrative solution or merge different procedures into an interoperability system via interconnected participants with high-level protocols and regulation when necessary, because different market participants may have separate benefits.*

**Keywords:** mobile payment, mobile commerce, payment procedures, mobile financial services, ICTS (Information Communication Technology Services)

### **1 Introduction**

Currently, a number of mobile payment procedures, which is a typical application of ICTS, have been used widely from developed countries to developing countries. Mobile payment is an exciting domain, which will rapidly evolve in the years to come (Karnouskos S. & Vilmos A., 2004). Today, mobile payments mainly pay for popular mobile content and services since there

are few alternative payment solutions available. Other successful applications include ticketing and vending (Mallat N., et al., 2004). However, these are still niche, not mainstream applications.

Mobile payment, also known as m-payment, is a new and alternative payment method wherein a mobile device is involved in the payment process in order to initiate, authorize and/or confirm an exchange of financial value in return for a wide range of services and digital or hard goods, instead of paying with cash, check or credit cards (Karnouskos S. & Vilmos A., 2004; Au Y.A. & Kauffman R. J., 2008; Dahlberg T., et al., 2007; Karnouskos S. & Fokus F., 2004). This definition includes a wide palette of approaches, and points out the fact that mobile payments do not restrict themselves to payments via mobile phone but can be made with virtually any mobile device such as smart-phone, PDA, tablet PC or even merchant-operated terminals (Karnouskos S. & Vilmos A., 2004).

The high growth rate of mobile handset diffusion in the 1990s is one of the tremendous success stories of the telecommunications industry, but it has slowed in recent years. Despite a widely reported economic slowdown in 2008, the global mobile handset market has been unaffected by the present economic slowdown. If there was one highlight in 2008, it was that the smart-phone segment grew 22.5 percent, according to IDC's Worldwide Mobile Phone Tracker report (IDC, 2009). Mobile payment transaction values for digital and physical goods to exceed \$300bn globally within five years, and forecasts total mobile payments to grow nearly tenfold by 2013, according to Juniper Research (Juniper Research, 2008).

Over the past five years, the mobile services industry has experienced dramatic changes. Europe, which led the way during the expansion of mobile telephone telephony in the 1990s, is challenged by Asia where emerging markets like China and India are in the spotlight of the basic mobile voice and messaging business, while South Korea and Japan have paved the way for more advanced mobile services (Vesa J., 2007). There is almost one - or more than one in some European countries (Finland, 114.5%, Statistics Finland, 2008) - mobile phone for every person in much of the developed world. In contrast, only 48.5% of Chinese population (641.2 million users) used mobile phones by the end of 2008 (MIIT, 2009), and the numbers are expected to rise to about 858.7 million in 2010 (IE Market Research-IEMR, 2008). The penetration of mobile phone users in China is extremely high and still growing very fast, and represents a significant potential from a mobile payment perspective.

Though mobile payment is an attractive domain and has rapidly evolved in recent years, the existence of standardized, interconnected and widely-accepted mobile payment procedures is crucial for the successful diffusion of mobile payment and mobile commerce globally, even in one country or region. In recent years, several new mobile payment procedures have been introduced to a variety of financial services, especially in Europe and Asia. However, these new procedures are typically provider-driven; in other words, the providers are in leading roles

compared with consumers. There are several efforts in the European Union (EU), as well as at the international level, in order to accelerate and solidly support emerging mobile payment solutions (Karnouskos S. & Vilmos A., 2004).

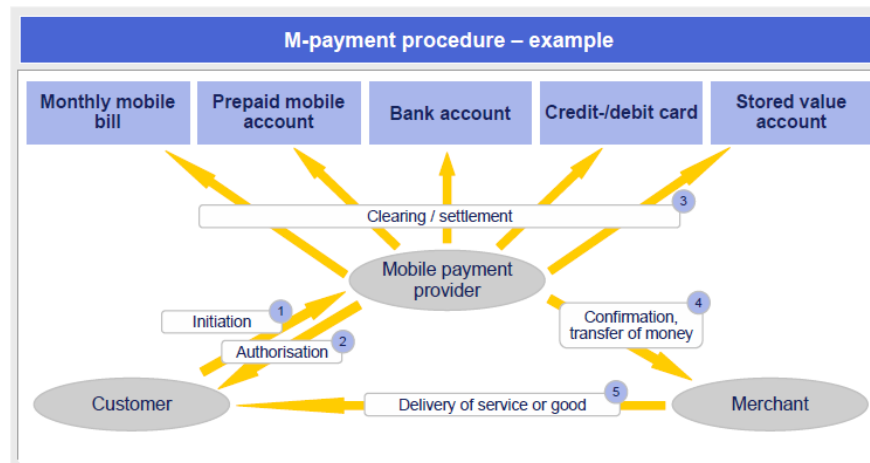
This paper compares mobile payment procedures in the Finnish and the Chinese market. Current payment procedures can be categorized by using strategic, participatory and operational criteria, according to the morphological method (Zwicky F., 1966). Based on this, this research analyzes the current constraints on mobile payment procedures in Finnish-Chinese market, and indicate that there are two possible solutions to promote the further development of mobile payment: developing a generally accepted mobile payment integrative solution or merge different procedures into an interoperability system via interconnected participants with high-level protocols and regulation when necessary, because different market participants may have separate benefits.

## **2 Current Finnish and Chinese Mobile Payment Market Overview**

### **2.1 Concept of Mobile Payment Procedure**

There is not a specific definition of mobile payment services in common on a global scale. According to the Directive on Payment Services, the concept of mobile payment services is included in Annex 7 (Directive 2007/64/EC). Payment service means, written in Article 4.3, any business activity listed in the Annex of the Directive on payment services 2007/64/EC, and there are seven cases in total. Furthermore, mobile payment services refers to the execution of payment transactions where the consent of the payer to execute a payment transaction is given by means of any telecommunication, digital or IT device and the payment is made to the telecommunication, IT system or network operator, acting only as an intermediary between the payment service user and the supplier of the goods and services.

Based on the discussions of mobile payment services, this paper adopts the definition of mobile payment procedure: A full mobile payment procedure contains initiation, authorization, clearing /settlement, confirmation and money transfer, and delivery of the service or good (Figure 1).

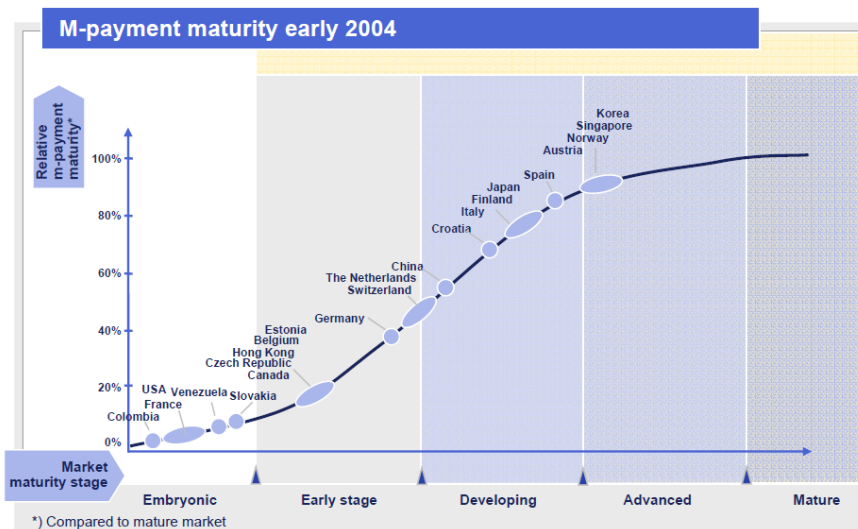


**Figure 1: M-payment procedure**

Resource: Arthur D. Little, <http://www.adlittle.es/>.

## 2.2 Mobile Payment Market Maturity

Arthur D. Little's Global M-Payment Report points out that the maturity of the Finnish mobile payment (including mobile devices, cards, mobile banking payment) market was about 70%; likewise, that of Chinese market was about 50% in 2004. However, Korea, Singapore, Norway and Austria are considered to have the most advanced mobile payment markets (Figure 2).



**Figure 2: M-payment maturity early 2004**

Resource: Arthur D. Little, <http://www.adlittle.es/>.

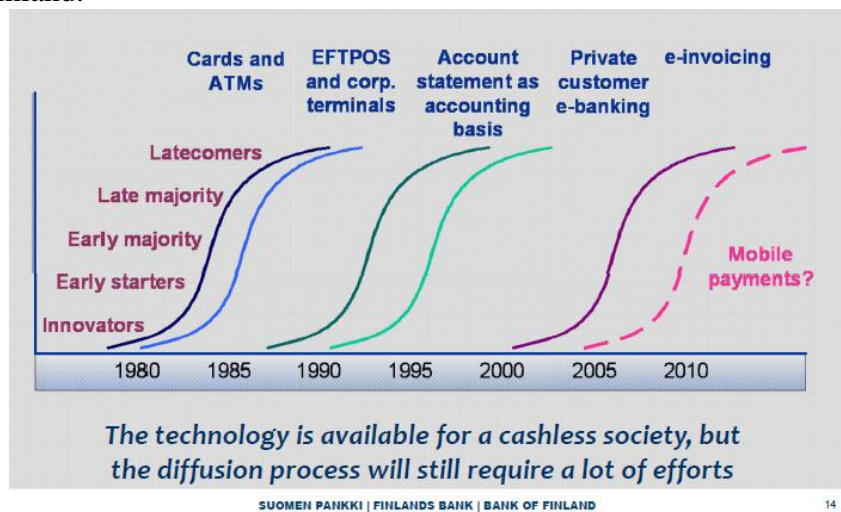
## 2.3 Mobile Payment Market in Finland

Finnish cashless payments, especially a variety of card payments, are considered main payments and are growing very fast this decade. According to the Federation of Finnish Financial Services (FFFS), the number of payment card transactions is up to 986 million, and the total value of card

payments per card is 11,216€ in 2007. Likewise, 4.28 million customers make transactions via Internet bank payments (FFFS, 2008). At the same time, the high rates of mobile phone subscriptions (114.5% in 2007) and the number of subscriptions per 100 populations in the recent decade in Finland is a success step of mobile payment and mobile commerce, with high rates for card-based payments (Telecommunications, 2007).

Some mobile-based banking services – e.g., credit transfers and balance inquiries – have been available in Finland since 1996. At first, mobile banking services were based on SMS text messages, and then on Wireless Application Protocol (WAP) phone banking applications. WAP phone-based solutions were launched in 1999, and now most Internet banking services offered by banks are also available via WAP. Even before GSM and WAP-based services, there was telebanking in Finland. People can still phone in to call centers and handle their banking affairs that way (Jyrkönen H. & Paunonen H., 2003).

Based on Finnish experiences, payment developments are relatively slow and follow an s-shaped diffusion curve (Figure 3). There is a long way to go in order to bring mobile payments from the application level to a high services level, considering the low penetration of mobile payment customers in Finland.



**Figure 3: Payment developments and diffusion in Finland**

Source: Bank of Finland, 2008

## 2.4 Mobile Payment Market in China

The penetration of mobile phone and financial card, users in China is extremely high and still growing fast, and represents a significant potential from a mobile payment perspective. According to the most up-to-date statistics, there were 633.8 million mobile users (MIIT, 11.2008) and 1.73 billion bank cards (PBC, 9.2008) in China, respectively. On the other hand, a CNNIC report said 117.6 million people accessed the Internet using their mobile phones last year, up to 133% from 50.4million in 2007 (CNNIC, 1.2009). Likewise, students are the main strength

of mobile Internet users, the study said: 43.5% of them use their mobile phones to read online news, download music, check email and perform a variety of other tasks (Ibid.).

On 7.1.2009, China issued long-awaited licenses for third-generation (3G) mobile phones, which enable faster data transmission and services such as wide-area wireless calls, Web surfing and mobile financial services. These most recent and significant changes in the technology, business and regulation environment have been the growing demand for mobility. It can be predicted that mobile payment is an important mobile financial application and is the key factor of mobile commerce in the future. Based on an analysis of different payment systems, a third-party payment platform is one way to avoid credibility and security pitfalls in e-business monetary transaction in China at present (Nie J., 2007).

**Table 1: Third-party electronic payment transaction volume market size**

	Internet Payment( ¥)	Third Party Mobile Payment( ¥)	Third Wired-Phone Payment( ¥ )
2008Q3	62,358 million	3,625 million	216 million
2008Q2	50,512 million	3,281 million	196 million
2008Q1	41,759 million	3,520 million	188 million
2007Q4	22,443 million	406 million	75 million
2007Q3	19,409 million	364 million	78 million
2007Q2	16,719 million	339 million	76 million
2007Q1	13,931 million	321 million	74 million

Resource: Analysys International, 2008. (Exchange rate: ¥: € = 931.2:1, 15.05.2009)

### 3 Mobile Payment Procedures

#### 3.1 Characters of Existing Mobile Payment Procedures

Some studies have found difficult to meet existing provider-driven mobile payment, adoption and diffusion procedures because of the demands of network integration and the services industrial chain. Most of the heavyweight companies, such as the mobile network operators (MNO), financial service providers (FSP), third-party service providers or specific intermediaries, device manufacturers and network commercial portals try via mobile payment platforms or their own standards to lead the new market (Karnouskos S. & Vilmos A., 2004). Mallat N. and Heijden V. D. revealed that the adoption of mobile payments is controlled by the two main adopter groups – consumers and merchants (Mallat N., 2006; Heijden V. D., 2002). More studies have demonstrated that the key to mobile payment acceptance is in the hands of customers, who are viewed as choosing the best option from a set of feasible options, based on consumer's preference. (Kreyer N., et al., 2003; Kreyer N., et al. 2002 (1); (2); Pousttchi K. & Zenker M., 2003; Pousttchi K., 2003; Au Y. A. & Kauffman R. J., 2008).

The theoretical background of adoption of the mobile payment procedures is based on the theory of consumer choice and demand. Some authors emphasize the importance of ease of use, usefulness and usage, as seen with the technology acceptance model (TAM) (Davis, 1989; Davis, et al., 1989). Others have mentioned the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975; 1980); the theory of planned behavior (TPB) (Ajzen, 1988; Ajzen & Madden, 1986); and

the diffusion of innovation and individual differences (Rogers, 1995). After reflecting on the issue of adoption and diffusion of mobile payment procedures mentioned above, some studies categorized the characteristics of existing payment procedures within a morphological box (Zwicky F., 1966) by using strategic, participation and operational criteria, according to the TAM Theory and morphological method (Kreyer N., et al., 2003; 2002 (1); (2); Pousttchi K., 2003).

Based on these discussions, and considering the characters of Finnish and Chinese mobile payment procedures, we propose a modification of the following morphological box:

Characteristic		Instances								
Strategic	Payment scenarios	MC	EC	Stationary merchant (person) P2P		Stationary merchant (automat) B2B		C2C		
	Payment levels	Picopayments ( $\leq$ 10 cents)		Micropayments ( $>$ 10cents to \$5)		Macropayments ( $>$ \$5 to \$50)		Macropayments ( $>$ \$50)		
	Service scope	Regional			National		International (Incl. EU)			
Participants	Payment provider	MNO	Bank/FSP		Third Party/Spec. intermediary		MNO+ Bank/FSP		Others	
	Data receiver	Payment service provider		MNO		Bank/FSP	merchant	nobody		
	Pre-registration	Yes				No				
	Technology required	Text-message exchange (SMS)		Internet-enabled phone(WEB/WAP)		Dual-slot/dual-card phone		Special payment software		
Operational	Basis of payment	Token-based			Account-based					
	Payment frequency	Pay per time unit			Pay per product unit		Subscription/standing order			
	Deduction time	Prepaid			Instant-paid		Post-paid			
	Method for settlement	Smart cards/Prepaid cards		Electronic cash/digital wallet		Direct debiting	Offline payment	Credit card	Telephone bill	

**Figure 4: Morphological box of mobile payment characteristics and instances**

Based on: Kreyer N., Pousttchi K. & Turowski K., 2002 (1); (2); Kreyer N., Pousttchi K. & Turowski K., (2003); Pousttchi K., (2003); Zwicky, F., (1966)

Based on the above, we modified and simplified the morphological box as follows, in order to easily compare and highlight the key features of mobile payment procedures in the Finnish and Chinese markets.



Characteristic			Instances					
Strategic	S <sub>1</sub>	Payment levels	S <sub>11</sub> Picopayments		S <sub>12</sub> Micropayments		S <sub>13</sub> Macropayments	
	S <sub>2</sub>	Services scope	S <sub>21</sub> Regional		S <sub>22</sub> National		S <sub>23</sub> International (Incl. EU)	
Participants	P <sub>1</sub>	Payment provider	P <sub>11</sub> MNO	P <sub>12</sub> Bank/FSP	P <sub>13</sub> Third Party/Spec. intermediary		P <sub>14</sub> MNO+ Bank/FSP	P <sub>15</sub> Others
	P <sub>2</sub>	Pre-registration	P <sub>21</sub> Yes				P <sub>22</sub> No	
	P <sub>3</sub>	Technology required	P <sub>31</sub> Text-message exchange (SMS)		P <sub>32</sub> Internet-enabled phone(WEB/W AP)		P <sub>33</sub> Dual-slot/dual-card phone	P <sub>34</sub> Special payment software
Operational	O <sub>1</sub>	Basis of payment	O <sub>11</sub> Token-based			O <sub>12</sub> Account-based		
	O <sub>2</sub>	Deduction time	O <sub>21</sub> Prepaid		O <sub>22</sub> Instant-paid		O <sub>23</sub> Post-paid	
	O <sub>3</sub>	Method for settlement	O <sub>31</sub> Cards			O <sub>32</sub> Telephone bill		

Figure 5: Modified morphological box of mobile payment characteristics and instances

## 3.2 Case Study on the Finnish and Chinese Markets

As mentioned previously, wide Internet, card and mobile phone penetration makes it possible to offer mobile payment; e.g., mobile financial/banking services, via mobile devices in the Finnish and Chinese market. Furthermore, there are some new solutions for paying for purchases by mobile phone.

### 3.2.1 Cases in the Finnish Market

Payment services have traditionally been provided by banks in Finland. During recent years non-banks, such as telecom operators, have started to provide payment services, and so competition has increased (Jyrkönen H. & Paunonen H., 2003). Since 1997, a Finnish phone operator, Sonera, has provided a service for paying a soda from vending machine using a GSM phone. Nowadays, ringtones, logos, Java games and True Tones for mobile phones through mobile payment are common services in Finland. Furthermore, city transportation tickets are offered using SMS, such as Helsinki City Transportation, which is charged on one's phone bill and needs no registration.

- Case 1: Helsinki City Transport (<http://www.hel.fi/>)

Text messages are a part of everyday life in Helsinki and the Helsinki City Transport Ticket service, which can be bought with mobile handsets, is another Finnish breakthrough in mobile services and m-commerce. Apparently, this scheme was very successful, as mobile ticket users are satisfied and the number of free riders has been reduced (Mallat, N., et al. [12]). All major mobile network operators in Finland, including Sonera, Radiolinja and Telia,

opened their network access for SMS-ticketing services. The ticket was specially priced (the client will get the ticket in the form of a reply message to his phone at a charge of €2) and is valid for a full day of travel on the city's green trams and metro service.

- Case 2: Sonera Shopper (<http://www.sonera.fi/>)

Sonera Shopper service, used since 2002, is provided by mobile operator Sonera, and has also been active in the payment area. In this system the customer opens a Shopper account and transfers money to it from his or her bank account. Thereafter, one can pay for purchases at merchants that have joined the system by sending a text message. The customer can also pay for purchases out of a credit card account (Visa, Eurocard and MasterCard) instead of his or her Shopper account when the customer's credit card number is entered into the Shopper system.

- Case 3: MediaPlazza (<http://suomi.ringtone-logo-game.com/>)

At the moment, MediaPlazza is a subsidiary of Jet Multimedia, one of the European leaders in interactive multimedia online services. MediaPlazza sells ringtones, logos, Java games and True Tones for mobile entertainment services more than 20 countries in the EU, including Finland, UK, Italy, France, Switzerland, etc. Like other providers, such as MTV Networks (<http://www.mtv.com/>), Jamster (<http://www.jamster.co.uk/>) and Aspiro (<http://buumi.net/>), the small company has committed itself to mobile entertainment in recent years. Also in this solution, the customer can download and pay for these digital entertainment productions by SMS, via online banking or with PayPal.

- Case 4: EMPS (Electronic Mobile Payment Services)

In September 2001 Nokia launched a dual-chip solution called EMPS (Electronic Mobile Payment Services). One chip was a usual SIM (subscriber identity module) card and the other was a WIM (WAP identity module) card issued by the Finnish bank Nordea for making Visa Electron payments. In this application the phone is equipped with one SWIM chip card that includes both the SIM and WIM functions. In this solution the operator handles customer identification. The credit card number (Visa) is stored inside the phone, and the consumer makes payments by phone and receives a credit card invoice later. It will build on the groundwork established by the Wireless Application Protocol (WAP), Bluetooth and the specification by Europay, MasterCard and Visa for smart cards (EMV).

- Case 5: International mobile payment procedures used in Finland

There are many international, especially European, mobile payment procedures used in Finland, such as Paybox, Mobipay, Mobilemoney, Payex, PayPal, Iti Achant and Mobilix. One of the most widespread mobile phone payment applications is Paybox (<http://www.paybox.net>), which was launched in Germany in May 2000, and later came to be used in Finland, Austria, Spain, Sweden and the UK. This service enables the customer to purchase goods and services and make bank transactions via mobile phone. The value of purchases or credit transfers is debited from the customer's bank account.

### 3.2.2 Cases in the Chinese Market

The use of mobile banking services is not the main mobile payment solution, which is common in Finland; however, third-party payment procedures are popular in the Chinese mobile payment market. Currently, there are more than ten mobile payment procedures available via GSM or CDMA cell phone and other mobile devices, which have brought Information Communication Technology (ICT) innovation to a practical stage in China.

- Case 6: Union Mobile Pay (UMP) (<http://www.umpay.com>)

Since its launch in mid-2004, UMP has becoming the leading mobile payment service company in China. UMP's payment procedure – with direct connections to ChinaMobile (CMCC) with the largest mobile user base and China UnionPay, which is China's largest bank card network association – covers 14 out of 16 banks in China. UMP is the operational partner of CMCC's "Mobile Wallet". Users can bundle their mobile number with a bank account and conduct a wide range of payment activities, and easily accomplish payment via SMS, IVR, USSD and WAP.

- Case 7: SmartPay (<http://www.172.com>)

SmartPay was founded in 2002 as a leading Chinese provider of wireless value-added services across mobile networks in China. Building up on the existing financial infrastructure, SmartPay enables individuals and merchants to securely and conveniently send and receive money anytime, anywhere, via mobile phone. Once signed up, one can connect mobile payment account with any bank card at one's disposal. SmartPay offers a complete electronic payment solution, supporting mobile payment, offline payment and online payment. The customers can send collection or payment information via SmartPay Website or SMS, when they need to pay.

- Case 8: ChinaDotMan (<http://ticket.9588.com> )

Established in 2000, ChinaDotMan (9588.com), with more than 7 million registered users, is one of China's leading virtual payments and wireless value-added service companies and was the first Internet Service Provider to provide WAP-based content. As one of China's first application solution providers for wireless Internet, ChinaDotMan provides on-line and mobile access to electronic air ticket purchases in real time 24 hours a day, 7 days a week. ChinaDotMan's unique e-ticketing service enables consumers to browse and book air tickets from anywhere at any time using cell phones or the Internet. ChinaDotMan's mobile platform not only serves end-users, it also provides value-added providers with an economical and convenient third party platform that supports mobile payments and e-money.

- Case 9: YeePay (<http://www.yeepay.com>)

YeePay is one of the leading electronic payment service providers in China, and provides mobile payment solutions and value-added financial services, including B2B and B2C. YeePay has formed strategic partnerships with major banks in China, and received an injection from IBM in 2005. YeePay's customers include leading Internet companies and ecommerce Websites as well as many merchants in traditional industries, such as Baidu,

TOM Online, Shanda, KingSoft, DangDang, eLong, GoMe Electronics and China Unicom. YeePay's mobile top-up service allows mobile users to link their mobile phone number to a bank card, providing a convenient alternative to the traditional prepaid card, which is very inconvenient for the end users and incurs additional costs for the carriers to manufacture and distribute the physical cards. YeePay's mobile SMS payment service allows users to purchase digital goods by sending SMS on their mobile phone, which is linked to a stored-value account.

- Case 10: PayEase (<http://www.beijing.com.cn>)

PayEase currently focuses on payment services that cover, but are not limited to mobile, online, call center (CRM), retail / POS and data mining of customers' profiles. The comprehensive payment procedure is connected to over 92% of most banks in China and supports over 64 domestic credit cards and debit cards, including 4 international credit cards accepted worldwide: MasterCard, VISA, American Express and JCB. PayEase's major customers cover Media, Travel, TV Shopping, Internet Shopping, Insurance, Mobile Carrier Industries and Online Game Operators throughout the country. At present, PayEase's mobile payment only provides mobile phone banking (ICBC, <http://www.icbc.com.cn/icbc/>) and MyWallet (<http://www.mywallet.com.cn/>) mobile payment solutions, which are used in B2B and B2C via consumers' accounts that are tied to one's bank card.

## **4 Comparison of mobile payment procedures in the Finnish and Chinese markets**

Based on the previous case studies and the modified morphological box showing mobile payment characteristics and instances (Figure 5), the comparison of mobile payment procedures in the Finnish and Chinese market can be summarized in Table 2.

**Table 2: Modified Morphological Box of Cases**

Cases	Characteristic																						
	Strategic						Participants						Operational										
	S <sub>1</sub>			S <sub>2</sub>			P <sub>1</sub>			P <sub>2</sub>			P <sub>3</sub>			O <sub>1</sub>		O <sub>2</sub>		O <sub>3</sub>			
	S <sub>11</sub>	S <sub>12</sub>	S <sub>13</sub>	S <sub>21</sub>	S <sub>22</sub>	S <sub>23</sub>	P <sub>11</sub>	P <sub>12</sub>	P <sub>13</sub>	P <sub>14</sub>	P <sub>15</sub>	P <sub>21</sub>	P <sub>22</sub>	P <sub>31</sub>	P <sub>32</sub>	P <sub>33</sub>	P <sub>34</sub>	O <sub>11</sub>	O <sub>12</sub>	O <sub>21</sub>	O <sub>22</sub>	O <sub>23</sub>	O <sub>31</sub>
1		√		√				√				√	√					√			√		√
2		√			√		√				√		√					√	√				√
3		√				√				√	√		√					√		√	√	√	√
4		√	√			√			√		√			√	√			√		√	√	√	√
5		√	√			√		√			√		√					√		√		√	
6	√	√			√			√	√		√		√	√	√			√	√				√
7	√	√		√				√	√		√		√	√	√			√	√			√	√
8		√	√	√				√		√	√		√	√	√			√		√	√	√	√
9		√	√	√				√			√		√	√	√			√	√	√	√	√	√
10	√	√		√				√			√		√	√	√			√	√			√	√

The meaning of related symbols shown in Figure 5

#### 4.1 Similarity

It can be clearly seen that the existing mobile payment procedures in both the Finnish and Chinese market are account-based (O<sub>12</sub>) and mostly pre-registration is needed (P<sub>21</sub>), according to Table 2. Furthermore, micropayments are the vital payment level and a common strategy (S<sub>12</sub>). Besides that, almost all of them can pay by SMS (P<sub>31</sub>), and most of them transfer data via Internet-enabled phones (P<sub>32</sub>). These studies revealed that banks and financial institutions cannot provide mobile payment alone, even though FSP (financial service providers) are important participants during the payment process. However, MNO and FSP have showed initiative in the field of mobile payments in recent years.

Currently, the high rate of bank cards' and mobile phones' penetration into wide electronic commerce makes it possible to offer mobile payments, thus furthering mobile financial/banking services via mobile devices in Finnish and Chinese market. For the one hand, the mature traditional card-based payments have challenged by the entry of MNO value-added applications and the new intermediary/third party payment services. On the other hand, dominating 2G to 3G mobile networks, simple voice and data transfer methods, such as SMS, are the killer services recently; however this will not last long. Long-term price competition has forced mobile operators began to seek new profit sources, and mobile payment is an important strategy. As previously mentioned in discussions mobile payment, regarded as one of the primary mobile financial services, is a service that needs the convergence of financial and mobile networks, as well as the integration of traditional and electronic commerce business from the perspective of the users. Future customers will be using mobile payments as a key of mobile commerce while

roaming between heterogeneous infrastructures composed of different networks. Meanwhile, enterprises coming from competitive domains take positive measures in order to enable and develop the interoperable mobile payment procedures via inter-industry cooperation at the regional and international levels.

## 4.2 Differences

Table 2 shows that although there are many similarities between China and Finland, there are, however, more differences than similarities. Evidently, most of the mobile payment procedures in China are limited to use in the restrictive regions, like Helsinki City Transportation in the Finnish market. However, other mobile payment procedures used in Finland are provided by international enterprises operating in the EU or on an international scope ( $S_2$ ). The third-party/spec. intermediaries ( $P_{13}$ ) are powerful participants and MNO + Bank/FSP ( $P_{14}$ ) are the important emerging forces in the Chinese mobile payment market. In China, pre-paid deductions are used as mobile payment than are instant-paid deductions ( $O_2$ ), as a result of an unsound personal financial credit system, while the reverse is true in Finland.

Based on previous discussions, in Finland, the use of Internet based banking services is very popular and some banking services are also available via mobile devices, such as WAP phones, digital TVs or PDAs (Personal Digital Assistants). Though telecom operators and special intermediaries have started to provide payment services, card-based bank payments are still traditional and main payment procedures. Currently, payment service providers are very different in the Finnish mobile payment market; e.g., bank/FSP, MNO, third-Party/spec. intermediary and MNO+ Bank/FSP ( $P_1$ ). To a certain extent, however, these services have obvious characteristics of homogeneous competition, although the payment scopes ( $S_2$ ) of mobile payment procedures have a national or international range. There are many obstacles to develop non-banks, or card-less mobile payments, in spite of a high proportion of mobile subscribers. Furthermore, it is hard to develop heterogeneous competition in a limited region because of low quantity of subscriptions, or to pave a new way and leave mature and highly developed bank card payment habits behind. At the EU level, the development of a unified, generally accepted, integrative mobile payment solution, in the form of a Universal Mobile Payment System (UMPS), has considerable feasibility, based on the efforts to establish a modern and coherent legal framework for payment services as common sense at the Community level in EU members, so as to enable the free movement of goods, persons, services and capital.

Relatively, cashless payment in China is not mature enough; however, the penetration of mobile users is very high and the proportion of subscriptions using mobile payments is rapidly growing nowadays although imbalanced in regional development. On the one hand, financial institutions are familiar with the financial business, but interoperability between different banks is seriously insufficient in China; on the other hand, mobile operators have powerful interconnected networks, with a lack of user trust in financial services because of unfamiliarity with the financial business. Therefore, the development and diffusion of mobile payments is based on cooperation between financial institutions and mobile operators via network integration and services merging, accompanied by heterogeneous competition and regional development. The emerging third-party mobile payment procedures are rapidly growing based on this situation,

especially MNO and Bank/FSP business cooperation as well as capital injection. However, it is, apparently, a long-term road to establish a unified mobile payment platform with huge regulatory and inter-industry negotiations costs. Hence, possible road map of mobile payment procedures is more likely to merge different procedures of interoperability via interconnected participants with high-level protocols by regulation when necessary, because different market participants may have separate benefits. For example, both MNO and FSP have recently focused on leading roles and more shares of benefits through business cooperation and network convergence.

## **5 Conclusions and Further Research**

A number of mobile payment procedures regarded as a typical application of ICTS have attracted increasing attention in a very wide range. This paper revealed that the existence of standardized, interconnected and widely-accepted mobile payment procedures is crucial for successful diffusion of mobile payment and mobile commerce globally, both in one country and in restrictive regions. According to the definition of this paper, the mobile payment maturity of the Finnish market is higher than that of the Chinese market, when one compares the overview of the Finnish and Chinese mobile payment markets. Applications of mobile payment, like transportation, mobile entertainment, parking, vending machines and stationary merchant, are relatively sophisticated in the Finnish market. However, considering mobile payment by mobile intelligent devices and 3G applications, the Finnish and Chinese mobile payment markets are still faced with challenges in coming years.

There are many similarities and differences in the characteristics of the current payment procedures in Finland and China, according to the Morphological Box comparisons. It can be clearly seen that the existing mobile payment procedures in both the Finnish and Chinese market are account-based and that pre-registration is typically needed. Furthermore, micropayments are the vital payment level and a common strategy. Besides that, almost all of the procedures can pay by SMS, and most of them transfer data via Internet-enabled phones. These studies revealed that banks and financial institutions cannot provide mobile payment alone, even though FSPs (financial service providers) are important participants during the payment process. However, both MNO and FSP have showed initiative in the field of mobile payments in recent years. Evidently, most of the mobile payment procedures in China are limited to restrictive regions, like Helsinki City Transportation in the Finnish market. However, other mobile payment procedures used in Finland are provided by international enterprises operating in the EU or on an international scope. The third-party/spec. intermediaries are powerful participants and MNO + Bank/FSP are important emerging forces in the Chinese mobile payment market. In China, it is pre-paid is used as deduction mobile payment more often than instant-paid deductions, as a result of unsound personal financial credit systems, while the reverse is true in Finland.

This paper indicates that there are two possible solutions to promote the further development of mobile payment: developing a generally accepted mobile payment integrative solution or merge different procedures into interoperability system via interconnected participants with high-level protocols and regulation when necessary, because different market participants may have separate benefits.

Beyond question, there are still some issues that need further study regarding mobile payment procedures, especially on the industry/market level. It is the key issue that clarifies the business model of mobile payment procedures on the industry/market level in the two distinctive markets. In the meanwhile, we need to analyze the legal issue: regulation, directives and laws of mobile payment markets. After these studies, we can clarify the role, the relationship, the obligations and the rights/benefits of mobile payment participants, including customers. Apart from that, understanding the economic theories would be helpful for these studies.

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