

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technology



DIPLOMA THESIS

Modern payment systems in e-business

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2. Objectives of thesis and methodology
3. Literature overview
4. Implementation of mobile e-money payment system
5. Conclusions
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7. Supplements

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Bibliography:

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In Prague: 15th January 2010

Declaration of Integrity

I declare that I have worked on my diploma thesis titled “Modern payment systems in e-business” by myself and I have used only the sources mentioned at the end of the thesis.

In Prague on 31st of March 2011

Iva Siedková

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Moderní platební systémy v e-businessu

Modern payment systems in e-business

Souhrn

Diplomová práce „Moderní platební systémy v e-businessu“ je členěna do pěti hlavních tematických kapitol. Úvod vymezuje oblast elektronických peněz v ČR, následují cíle a metodologie této práce. V literární rešerši práce pojednává o online platebních systémech využívaných v současnosti jak v České republice, tak i ve světě. Dále rešerše uvádí základní pojmy od elektronických peněz a e-businessu přes Internetové platební protokoly až po možnosti placení elektronickými penězi. Ve světě i v České republice je mnoho elektronických platebních systémů, proto práce uvádí jen výběr několika známých a používaných. Práce porovnává některé z využívaných systémů v České republice. Kapitulu literární rešerše uzavírá výhled do budoucnosti ohledně možnosti mobilních plateb. Praktická část se soustřeďuje na úvodní výzkum pro implementaci nového platebního systému na český trh. Je zde proto kromě popisu také zpracován obchodní a finanční model daného produktu, který však není vzhledem k možnostem a rozsahu diplomové práce detailně rozpracován. Vlastní práce je zakončena vyhodnocením dotazníku ohledně platebních metod, ale především také ohledně nového mobilního platebního systému. Závěr shrnuje výsledky získané z praktické části této práce.

Klíčová slova: e-business, elektronické peníze, platba, Internet, mobilní telefon, mobilní peněženka, EMI

Summary

The thesis “Modern payment systems in e-business” is divided into five main chapters. Introduction defines e-money in the Czech Republic, and is followed by the objectives and methodology of this thesis. The literature overview deals with online payment systems used currently in the Czech Republic and also abroad. Further, the literature overview provides the basic concepts of e-money and e-business, Internet payment protocols and payment options for e-money. There are many electronic payment systems in the world as well as in the Czech Republic, thus the thesis provides a selection of several well-known and used. The thesis compares some of the systems used in the Czech Republic. The literature overview concludes with future visions regarding the possibility of mobile payments. The practical part focuses on the initial research of implementation of the new payment system on the Czech market. There is, therefore in addition to the description, processed the business and financial model of the product, which is not due to the possibilities and scope of the thesis developed in detail. The thesis ends with the evaluation of the questionnaire about payment methods, but mainly about the new mobile payment system. Conclusion summarizes results obtained from the practical part of this thesis.

Keywords: e-business, e-money, payment, Internet, mobile phone, mobile purse, EMI

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1 Introduction

Nowadays, the world of technology is connected with the awareness of its typically quick process of innovation. In last two decades, the usage of credit cards and e-money payments in general, has spread all around the world. Considering the increasing number of Internet purchasing or transactions of e-banking, it is necessary to develop and modernize these systems for e-money payments, which could ensure complex utilisation of modern technology in the future as for instance connecting information channels as well as payment systems and satisfying many other needs of its clients.

Considering the general payment e-money circle, it is important to realize that it consists of four parties – payer, beneficiary and their banks. Each credit transfer can represent a circle of entities i.e. customer-to-customer, customer-to-bank, bank-to-bank and bank-to-customer, and in each step there are some necessary tasks and procedures. It means, among others, control, verifying the information on e-bills, electronic payment instruction, receipt of electronic statements and real-time notification of received payments. These systems using e-money provide a possibility to do business faster and at a lower cost than before.

Moreover, there are many possibilities on how to pay in the e-business environment i.e. traditional credit cards which are commonly used on the Internet, followed by virtual cards which represent only numerical code for this purpose and check payment systems which use different cryptographic techniques.

Recently, new payment systems were introduced i.e. PayPal and PaySec. Last but not least, it is possible to pay with your mobile phone and not only in the presently known form of m-banking.

In some countries there are elaborated systems for this, but in the Czech Republic it constitutes only paying through sending short text messages or data transmissions. These systems as a whole are mostly connected to topics like security, transaction costs and user's privacy. Sometimes, as in a case of mobile phones, there is no willingness in using it for paying, but this last problem comes out especially from the conditions mentioned above.

Imagine what would happen if there was a new product on the Czech market, which would allow everyone to pay easily and quickly for any goods or services at the moment of the purchase without any extremely high fees and security threats. Would the population use this payment system? This mobile payment system could be called SMP4U and the second part of this diploma thesis is dedicated to this topic.

2 Objective and methodology

The main objective of this diploma thesis is to define and describe e-money payment systems available in both the world and the Czech markets as well as its working security and usage. It is dedicated to the explanation of the terms as e-business and e-money, basic concepts of payments mechanisms, as well as the Internet payment protocols, but as mentioned before, it deals mainly with e-money payment systems which are working in changeable conditions because the process of innovation is really fast.

The objective of the practical part is to analyze the possibility of launching a new mobile payment system in the Czech market, which should overcome disadvantages of the current systems. The analysis is based on a review of existing payment systems. Data was collected in a questionnaire survey. There is also a description of the product, analyses and a potential business plan if launched in the market.

The methodology of the literature overview is based on the information and analysis of articles and studying suitable literature and Internet resources. The literature overview deals with e-money and also traditional payment systems problems and issues connected to all means being used in any credit transfer.

The second, so-called practical, part is composed of data evaluation of the questionnaire as an empirical method regarding a survey about the current situation and exploring society's attitude towards payments and also potential willingness of future usage of such a new product as the mobile payment system. Furthermore, there is a chapter dealing with a business project with characteristics of the new system, its potentials and analyses. In this part, costs and profit analysis was used and also a method of benchmarking. Finally, the

diploma thesis ends with a conclusion with answers to main questions like: What is the current situation in the Czech Republic? How would the new mobile payment system work? Would the population accept and use it? There is also a possibility that the project would not work, respectively that it would not be feasible or that society would not be willing to use it, thus the project should be rejected. The evaluation of the potential of the SMP4U is also objective of the conclusion.

3 Literature overview

The aim of the diploma thesis is to focus on relatively new possibilities of payment. It is about investigating main types of modern payment systems and issues connected to them. Primarily, it is essential to mention that there are some terms connected with this topic e.g. e-business, e-money and issues tied up with these terms, so the literature overview should start with defining them.

3.1 E-business

Basically, e-business represents the use of the Internet in daily business to connect with customers, business partners and suppliers. More deeply, it means that companies share information and conduct electronic transactions with these parties mentioned previously. It involves also new business models implementing a range of possibilities on how to sell and cooperate on the Internet. Usually, e-business is confused with the term e-commerce. Although the terms e-business and e-commerce are often used interchangeably, they are different.

E-commerce is doing business electronically across the extended enterprise. It covers any form of business or administrative transaction or information exchange that is executed using any form of information and communication technology. [6]

E-business is a wider concept that embraces all aspects of the use of information technology in business. It includes not only buying and selling, but also servicing

customers and collaborating with business partners. It often involves integration across business processes and communication within the organisation. [6]

3.2 E-money

The term e-money represents money in an electronic form. As the world of technology is still progressing with new innovative designs of payments systems being developed, it is necessary to have a brief look into all activities and systems connected to e-money. Recently, e-commerce and e-business no longer exists as a whole as m-commerce and m-business are evolving massively as well.

According to the European Central Bank, e-money is defined as an electronic store of monetary value on a technical device that may be widely used for making payments to undertakings other than the issuer without necessarily involving bank accounts in the transaction, but rather acting as a pre-paid bearer instrument. [2]

Nevertheless, cash payments are the most common form, but recently banks increased the attempts wean customers to use electronic payments and are having increasing success. The idea of electronic money and electronic payment systems appeared many decades before, but has turned imagination into reality with the use of the Internet. The Internet had a long way to go since its inception in the late 1970s to today's global use as a medium. The real boom for e-money started around the year 1996 when e-commerce begun to emerge. From that time it is in an endless process of development.

Technologically, electronic money products can come in one of two forms. Hardware-based products and software-based products. [2] Furthermore, Pringle and Robinson distinguishes 'digital cash' and 'network money' depending on whether pre-paid software products using computer networks or hardware-based products transferring money across a telecommunications network such as the Internet is considered. In the case of hardware-based products it is referred to as electronic purses or multi-purpose pre-paid cards.

E-money and payment systems are used both in B2B (business to business) as well as in B2C (business to customer) forms. Moreover, it can be a useful means of paying in all existing forms of business (e.g. customer to customer C2C and customer to business C2B)

as well. Then, it could be divided into three different categories according to the sum transferred by a payment system. Those categories are micropayment, consumer payment and business payment. E-money is considered to be a favourite because of its low transaction cost with savings which may be beneficial for an economy.

It is also important to mention that there is a regulatory legislative approach to e-money. It is strictly controlled, which institution can issue e-money. On the one hand, it is good to set some rules and control, but on the other hand, this could limit competition and innovation.

The EMI (European Monetary Institute) directs these issues. The regulation consists of the European Parliament and Council Directive 2000/46/EC on the taking-up, pursuit of and prudential supervision of the business of electronic money institutions and European Parliament and Council Directive 2000/28/EC amending Directive 2000/12/EC relating to the taking-up and pursuit of the business of credit institutions. [2] Once the institution has complied with these rules in one of the member states, it could then issue e-money in the whole of the EU.

There was also founded in the UK in October 2001, Electronic Money Association (EMA) by e-money issuers and prospected issuers. The Electronic Money Association is the trade body for electronic money issuers and payment institutions. Members include payments companies, the telecommunications and transport sectors and specialist e-money issuers. The EMA is the industry's voice in dealing with regulators, government bodies and international organisations. It is a forum for education, responds to regulatory proposals and provides industry guidelines. [11]

3.3 Electronic payment systems characteristics

When considering any electronic payment system, there should be some basic conditions and requirements which should be met, relevant to each payment scheme. The most important factors to keep in mind are security, transaction costs, traceability of payments, online verification requirement, acceptability, transferability, divisibility and last but not least, it is important to decide whether it would be software or hardware solution.

Nowadays, there are so many electronic payment system variants with different infrastructures that depend on the payment scheme. Mostly it needs some user authentication mechanism and access control system. In most cases, the exchanging of sensitive data created a need to protect data from manipulation by encrypting it. It is necessary to secure data transmissions with the isolation of the communication infrastructure and encryption of the data prior to the transmission as mentioned above.

There are two possibilities of data transmission. Firstly, using isolated networks for financial transaction processing such as EFTPOS (Electronic Funds Transfer at Point Of Sale) or SWIFT (Society for Worldwide Interbank Financial Transaction) is quite an expensive solution because it is not only about setting it up, but also maintaining it. The second possibility is the use of encryption techniques for the transmission of financial transactions using public communication networks such as phone connections or the Internet.

To achieve secure data transfer, the encryption key is made public while the decryption key is kept private. To secure a data transfer, the sender first obtains the receiver's public encryption key, and encrypts the data prior to sending it with this key. Now, only the receiver can successfully decode the message, and intercepting it will be useless to any intruder. [1]. The authors also mentions that the possibility of decoding data encrypted with public key encryption decreases exponentially, depending on the bit-size of the key.

As mentioned above, the system must verify the identity of a user. This user identification is used in any type of electronic purse. There is a number of different variants such as PIN numbers, electronic signatures, password schemes, certifying electronic signatures as well as other authentication schemes.

PIN is the most common user authentication system for magnetic stripe keyboards such as ATM keycards and credit cards, but it also provides a weak level of security including the human factor (people do not remember numbers and write them down) Also, a four-digit PIN provides only 10,000 possible combinations, so it can be found out through trial and error. On the other hand, a password scheme is the most commonly used in computer based systems. It is considered a more successful solution than PIN because there is a huge number of possible combinations which eliminates finding out through trial and error. It is

also connected with time associated with unsuccessful attempts. However, in this case everything depends on the human factor and human memory again as well as the PIN schemes.

Electronic signature schemes are used to verify whether a particular person is really the sender of the message or the author of some information, including the protection of forgeries. It is based on using a private encryption key and a public decryption key so it acts as a personal signature or stamp.

In a public key encryption based system, security can be viewed as a combination of encryption and a second authentication scheme, usually password based. A computer does the encryption computations, but to operate, users must first authenticate themselves using a password. This is effectively the case when using public key encryption over the Internet where the access to the local system is usually controlled by passwords. [1]

A password protected portable computer (e.g. smart card) is the most secure electronic authentication scheme available today at reasonable cost. It is used for both access verification and payments in systems currently being developed. [1]

Certifying electronic signatures work to beware of “spoofing”. Certification prevents the third party from going one step further and even posing as the authority. [1]

Nowadays, there are many other authentication schemes, but are still not economical enough to be used for payment systems. Therefore, these high secure future solutions would offer improvements of system security by fingerprint, voiceprint or even genetic fingerprint.

Among hardware protection mechanisms, could be mentioned for example number of unsuccessful attempts to enter the PIN stored on the card.

Besides security, another very important criterion is transaction cost. There are defined transaction costs to be both the time needed for a transaction, and the financial expense associated with processing overhead, hardware costs, and other financial expenses, including the damage caused by fraud in a particular system. [1] According to Furche and Wrightson, transaction costs are divided into three categories – high, medium and low. High transaction cost occurs whenever something is processed manually, for example

credit cards have high transaction costs. Cheaper and faster variants are medium transaction cost with EFTPOS schemes as a representative of this category. Low transaction costs are connected with reduction of hardware and communication expenses and eliminating the need for online clearance such as phone card systems or token-based online electronic cash systems (the basic concepts of payment systems are specified in the next chapter). The transaction cost influences a lot whether and to what extent the system would be used. High transaction cost and long processing time of transactions are inconvenient and uneconomical so the future belongs to flexible, fast and low transaction cost systems. [1]

Therefore, when considering security and transaction costs of the payment system, it is inevitable to think of traceability of payments, where there are recently recommended systems with lower levels of traceability, then acceptability which should not be limited to only one bank. Bearing in mind transferability, it is not possible to make a transfer of funds without contacting the bank for clearance of the transaction. Another feature of payment systems is divisibility. And moreover, one of the most important is the fact that the software-only solutions are perceived as superior to a hardware-based solution. Although on the other hand, systems with tamperproof hardware protect the information from the user of the device. [1]

Critical factors for the success of e-commerce payment systems:

- Integrity: transaction data is transmitted and received unchanged and as intended.
- Non-repudiation: transactions have the quality of non deniable proof or receipts.
- Authentication: identities and attributes of parties engaged in commerce are established a tolerable level of risk.
- Authorization: individuals are established and recognized as entitled to receive, send or view transactions.
- Confidentiality: transactions can be protected from view except by those who are authorized.
- Reliability: probability of failure in the transaction-send, receive, acknowledge-is low.

Functionally, money technologies also need to achieve these operating characteristics: privacy, scalability, ease of use, personalize-able, seamlessness, interoperability, write one-apply anywhere and cost effective. [8]

3.4 Main types of electronic financial transaction systems

3.4.1 The traditional account – transfer system

According to Furche and Wrightson, it is the most commonly used system which requires both parties regarding the payment to have a bank account and it works as a fund transfer from one bank account to the others' bank account. It is more expensive to achieve a high level of security in this system and transaction costs are also about medium to high. Considering the level of privacy, it is not possible to pay with this system without high (unconditional) traceability, all information is recorded. [1]

3.4.2 The check system

This system is based on public key encryption and an electronic signature, which influences mostly high transaction costs. As in the previous case, there is no privacy in using it, or it is even more limited because it requires also online verification.

As with personal paper checks, party A (here: the customer) writes out a check and signs it, then sends it to party B (here: the merchant). Party B deposits the check in his account, and the amount is subsequently cleared and negotiated between A and B's bank. [1]

3.4.3 The single – use token system

The single – use token system is based on the concept of electronic tokens issued by a central bank with their electronic signature to guarantee its authenticity, which is represented by a message stating its value that can be stored on a user's computer. It is connected to problem of double spending so it is important to ensure that it cannot be copied and used twice. This system is often referred to as “electronic cash” and because of some differences from real cash, it is called “cashlike” electronic payment systems, as remarked by authors Furche and Wrightson [1].

Due to its need of online verification, it is well suited for the Internet. A high level of security can be achieved and depending on the infrastructure, transaction costs could vary from low to medium levels. Furthermore, it allows the realization of an anonymous and untraceable payment system, so it is considered as systems conserving given level of privacy.

3.4.4 The multi – use token system

It is a cash system, but as in the previous case, because of the problem of security it is also called a “cashlike” system, implying that the token does not need to be verified by a central entity and could be passed among users an unlimited number of times as referred by Furche and Wrightson [1]. It could create a problem of double spending mainly because of no verification needed.

3.4.5 The secure counter system

The secure counter system is assumed to be in conjunction with tamperproof hardware and such designs are implemented in smart card based payment systems. In this kind of system, a high level of security can be achieved with low to medium transaction costs according to Furche and Wrightson. [1] It could also provide untraceable payments because there is no need of online verification as in the previous case.

3.5 Internet payment protocols

There are some protocols developed to be used for payments on the Internet. In this chapter, there is a brief description of each.

3.5.1 iKP – Internet Keyed Payment Protocols

The iKP was developed by IBM and consists of three protocols. There are three parties involved in each payment, the seller, the buyer and the acquirer, which is actually the seller’s bank. 1KP, 2KP and 3KP differ in the level of security in using public key encryption (authorization), which means that it does not involve any new technology. The biggest advantage of this protocol is that it offers a relatively inexpensive solution as the

minimum transaction cost is limited by Electronic File Transfer provider. This protocol is based on the account-transfer system with unconditional traceability of payments and no user privacy. [7]

3.5.2 STT – Secure Transaction Technology

STT was developed by VISA and Microsoft and released in September 1995. This protocol best represents a “virtual credit card system” for the Internet. The parties included in the payment are the cardholder, the merchant, the two banks – issuer and acquirer and the central authority – Credential Authority. Each participant has two public/private key pairs. The encryption key is published and the decryption key is kept private for one pair and for the other pair, the decryption key is published so that the corresponding encryption key acts as an electronic signature. Credential Authority ensures by its sign the authentication of credentials – messages containing a user’s name and his/her public key. The Credential Authority is equal to the association, for example to any credit card company. A cardholder's credentials are issued by the issuer, which is his/her bank and similarly an acquirer sends credentials to a merchant. The hierarchy of issuing credentials represents exactly the hierarchy of today’s credit card system. It is considered as a secure account-transfer system with unconditional traceability and no user privacy as in the case of iKP. It offers secure exchange of messages between any two parties. With this protocol it is important to mention that it creates the overhead costs. It also introduces a new feature, “dual signatures”. It is necessary to admit that STT has been replaced by SET. [7]

3.5.3 SEPP – Secure Electronic Payment Protocol

SEPP was released in November 1995 as a competing scheme to STT described above. It was developed cooperatively by MasterCard, IBM, Netscape, GTE and CyberCash. Therefore, as mentioned in STT, SEPP adopts the current credit card system for the Internet through the use of public key cryptography, however, SEPP focuses more on the process whereas STT is focused on modelling the credential hierarchy. There are the same five parties as mentioned in STT, i.e. cardholder, the issuer, the merchant, the acquirer and the certificate authority. A certificate in SEPP corresponds to the credentials in STT. It is unnecessary for all parties to use the Internet, only four have to be there. It does not model the whole process on the Internet, other is Bank network for the issuer and also for the clearance of each payment. Each of the parties involved have two public-private key pairs,

one as a signature with the encryption key kept private, and one to ensure secure transmission over the network with the encryption key made public. There would be more detailed information about SEPP, however it is necessary to mention that only three months after SEPP was published, VISA and MasterCard jointly released the successor of SEPP and STT, called SET where many features from SEPP were not adopted. So it is unlikely that SEPP will ever be implemented. [7]

3.5.4 SET – the Successor of STT and SEPP

As mentioned above, SET was published in February 1996 by VISA and MasterCard. SET is defined as a combination of STT and SEPP, nevertheless SET is more related to STT. SET should be viewed more as a secure communication standard than as a payment mechanism. [7]

3.5.5 Chaumian electronic cash

In contrast to all protocols mentioned above, Chaum developed the first token based system on the Internet with online verification. The main difference is that it does not transmit transaction details for transfers to be processed within a bank or between banks, but instead, it is based on the issuing of tokens with some value just as banknotes. Chaum supposed a standard scheme for online electronic cash payments and introduced the concept of blind signatures using multiplication of the identification number of banknote by a blinding factor. The main advantage of this system is that it offers untraceability of payments as there are only a few existing protocols, but only regarding the customer (the payer). There is no anonymity for merchants (the payees), who are identified to both the payer and the bank. Another great advantage is that it has the potential of being significantly cheaper on a per transaction basis than account based systems. [7]

3.5.6 Millicent

It was developed in 1995 at DEC's System Research Center as a low cost account based transaction protocol exclusively for low value transactions with a transaction cost of less than a cent. There is no strong security, but users hold only a few dollars worth Millicent change called scrip. It is an account based system in contrast to other low value transaction protocols. The accounts are maintained locally at every vendor for customers buying goods. To reduce overheads, customer accounts are set only temporarily with involving the expiration date in the account. Therefore scrip includes the account name, the account

balance and the account expiration date. This protocol proposes three levels of security, first level with unprotected messages, second with unreadable messages and the third one with security for payments. There are brokers introduced to the system to avoid overheads to reduce the number of accounts needed for customers. [7]

3.5.7 SSL

SSL (Secure Sockets Layer) is the standard security technology for establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remain private and integral. SSL is an industry standard and is used by millions of websites in the protection of their online transactions with their customers. The public key does not need to be secret and is placed into a Certificate Signing Request (CSR) - a data file also containing the client's details. During the SSL Certificate application process, the Certification Authority validates the client's details and issues an SSL Certificate containing the details and allowing a client to use SSL. The client's web server matches the issued SSL Certificate to a private key. The client's web server is then able to establish an encrypted link between the website and its customer's web browser. [12]

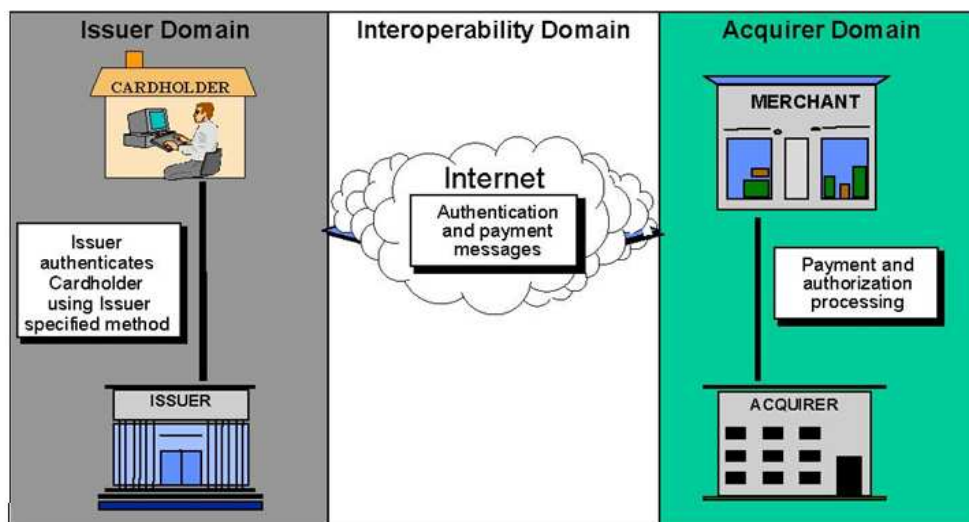
The complexities of the SSL protocol remain invisible to the customers. Instead their browsers provide them with a key indicator to let them know they are currently protected by an SSL encrypted session - the lock icon in the lower right-hand corner, clicking on the lock icon displays the SSL Certificate and the details about it. All SSL Certificates are issued to either companies or legally accountable individuals. Typically an SSL Certificate contains the client's domain name, company name, address, city, state and country. It also contains the expiration date of the Certificate and details of the Certification Authority responsible for the issuance of the Certificate. When a browser connects to a secure site it retrieves the site's SSL Certificate and checks that it has not expired, it has been issued by a Certification Authority the browser trusts, and that it is being used by the website for which it has been issued. If it fails on any one of these checks the browser displays a warning to the end user letting him/her know that the site is not secured by SSL. [12]

3.5.8 3-D Secure

The 3-D Secure protocol underlies the Verified by Visa payment service or MasterCard SecureCode payment service. 3-D Secure is an authentication technology that uses Secure Sockets Layer (SSL/TLS) encryption and a Merchant Server Plug-in to:

- pass information and query participants to authenticate the cardholder during an online purchase, and
- protect payment card information as it is transmitted via the Internet. 3-D Secure is based on the three-domain model illustrated in the Figure 1. [13]

Figure 1. Three-domain model



Resource: Verified by Visa, Visa International Service Association

3.6 Risks connected to payments in e-business

Despite the fact that shopping on the Internet is the trend of modern times, there are some risks and threats connected to it. The most worrying could be the security risks greatly discussed nowadays whenever this topic is mentioned. The most important is the security of the computer avoiding hacker attacks and various types of viruses.

First, the verification whether the e-shop is believable and reliable, or could be certified, is a good sensible step.

There are several possibilities of paying in e-business. Each e-shop offers different means of paying, but commonly, the safest one is cash on delivery because there is no need in entering the number of a credit card. Considering the fact that cash on delivery is more expensive, other methods of payment are possible. Internet banking and its bank account money transfer could be used as an alternative option. The disadvantage of this could be that it lasts quite a long time, actually few days, and a mistake could easily be made when entering the bank account and the sum would reach a different account. Another possibility is to use a credit card. It is quick and often without any expensive costs overhead for the payer, but they should be careful about the credibility of the seller because important data about the card and the card-owner has to be entered.

Nowadays, there is a very popular payment system, which works as an electronic purse. There is no need in remembering any important data except the access and password. The advantage of these systems is also the set amount of money to secure the customer when there is an incorrect behaviour of the seller. Another method could be paying through sending short text messages which are distinguished into premium SMS, DMS and other SMS, which are more expensive than common messages, using the code. This is used when paying lower amounts. On the other hand, the problem is that the operators set quite a high percentage of the paid amount.

The problem with online payments could be summed up into three main topics. First, there is the awareness that payment systems are slow and expensive. Other opinions against online payment systems are that payment systems are closed and opaque in the sense of cost structures, operating costs or profitability. Last but not least is the fact that payment systems are not suited to all types of e-commerce. Considering these facts added to the security of the payment system, these issues could be important information for new products developed in the near future.

3.7 Types of e-money payment systems

Although the theme of this chapter is e-money and its payment systems, it is crucial to start with a different types of payment, because the Czech Republic is a bit different case than

the rest of the world. There are described some methods used in e-business in the Czech Republic which are also mentioned in the previous chapter.

According to the Association for Electronic Commerce (APEK) which published results of a study of payment methods in the country in 2008, so far there is no universal payment system. APEK confirms that the most popular payment instrument in the Czech Republic is still cash on delivery. It is offered by 97% of e-shops and customers use this form in 70-80% of cases. In the Western world, cash on delivery belongs to the third most favourite payment method (around 12%) and preferred payment method is payment by credit cards (80%). Other favourite payment methods in the Czech Republic are transfer on the account and payment in cash at the distribution point. Also hire purchase is gaining considerable popularity. Credit cards and payment gateway have about 10% share. The e-shops supply payment methods in this order: cash on delivery, transfer to the account (97% of retailers), followed by payment at distribution points (74%), the payment gateway (60%), hire purchase (57%), and credit cards (around 40%). The reason for this form of payment is likely the distrust of the Czechs to enter their credit card numbers for purchases in e-shops and thus prefer the more expensive method of cash on delivery. On the other hand, many e-shops offer no shipping costs at a higher price for the goods, so maybe that is the reason why the customers decide often for the cash on delivery option. [14]

Aukro.cz did a similar survey in the year 2010 and found that more than 90% of Internet users have already tried e-shopping, but only about 48% of the total population of the Czech Republic have experienced online payments. The majority uses cash on delivery (84%), payment by bank transfer (74%) or payment in cash (70%). Fast payment channels such as credit cards, electronic purses or PayU are used by approximately 55% of shoppers. The fact is that the situation is reversed in Western countries where it is usual to pay online for 90% of shoppers. The most commonly reported were modern payment channels as Mojeplatba from Komerční Banka, ePlatby from Raiffeisenbank, mPeníze from mBank, and then PaySec, PayPal and PayU. One fifth of the population knows about these payment options, however, personal experience with them has only been experienced by a relatively small fraction of the population. The difference between the survey from 2008 and 2010, is that Mr. Kalapoš from Aukro.cz thinks that Czech society is not afraid of online payments, but that shoppers use old-fashioned payment methods because they do

not realize all the advantages of modern payment channels such as their ease of use, speed in receiving payments and transaction security. [15]

3.7.1 Cards

There are four types of cards according to so-called method of accounting. First, a debit card is a card with which goods or services can be paid for in a shop or cash withdrawn from the ATM where the account for which the card was issued disposes with enough money. The bank deducts the amount directly from the customer's account. Secondly, a credit card works in a sense of buying goods or services on credit. The showdown occurs after a specified time by the bank. The loan is drawn through a revolving credit limit which is renewed automatically after the amount due. The bank sets the minimum payment amount of the loan, usually it is 5-10% of the outstanding amount, and credit limit according to the client's creditworthiness. Then, a charge card works in a similar way as a credit card, but charge card does not mean purchases on credit. The settlement, which is also a given date (usually 14-30 days), the entire outstanding amount must be paid at once. There is no interest charged. Finally, a shopping credit card is a credit card issued by non-banking institutions.

Cards could also be divided according to the mode of accomplishment to embossed and electronic cards. An embossed card is a card with a so-called relief of characters. These cards allow you to shop, even in the stores which are not equipped with an electronic terminal. The trader uses an imprinter - mechanical sensor, which removes all fingerprint data on the punched card and customer data is signed. Embossed cards can be used in more places than the electronic card which is on the other hand the most commonly used card. These cards are usually issued for free to a bank account holder. They are designed primarily to make withdrawals from ATMs and for payment at merchants who have electronic payment terminals. The disadvantage so far is their limited applicability for payments in the stores.

It is also possible to divide cards into groups of domestic or international use. The main issuers are MasterCard, Visa and Maestro. [16]

3.7.2 Pre-paid cards

Pre-paid cards are defined as a payment instrument used to pay for goods and services, where appropriate, or to withdraw cash from ATMs. Clients have to deposit money to the card account by bank transfer, credit card or as cash. There are fees for issuance and usage of the card. There are several types of pre-paid cards – Gift cards, Payroll cards and Commercial cards or Spending defined cards. They are offered by MasterCard, Visa and American Express. Pre-paid cards are also issued by large retail chains, where pre-paid cards can replace the vouchers or checks. There are many different designs of these cards and it is possible to purchase them via Internet. While pre-paid cards are standard in the USA and a widely used product, Europe is still in the inception stage. The most developed market is in the United Kingdom, followed by Italy, it is gradually developing in Germany and Austria, and they were issued some years ago by some banks in Croatia and Hungary. Pre-paid cards are also considered along with contactless and mobile payments as a major product development in the near future.

In 2007, its turnover grew by 70% to 5 billion USD in the USA and two years later it was about 14 billion USD. An interesting point is that the turnover of pre-paid cards have increased by 7%, while the credit card market in the USA decreased from January to September 2009 by 10%. In Britain, in 2008, the market of pre-paid cards reached 4 billion GBP and there were 2.3 million of pre-paid cards. [17]

3.7.3 Bank electronic cash

European banks have spent a lot of time and effort over the last decade on the electronic purse – a smart card carrying some form of electronic cash that is intended to replace notes and coins. The business case for the bank issued e-purse looks quite poor and many early schemes failed miserably. [2]

E-cash, for example, can be “programmed” in a way that notes and coins cannot. Issuers could, for instance, restrict its use in many ways: to a closed group of merchants or consumers, to certain products or services, to geographic areas or particular time scales. [5]

3.7.4 Smart cards

A smart card, typically a type of chip card, is a plastic card that contains an embedded computer chip, either a memory or microprocessor type that stores and transacts data. This

data is usually associated with either value, information or both and is stored and processed within the card's chip. The card data is transacted via a reader that is part of a computing system. Systems that are enhanced with smart cards are in use today throughout several key applications, including healthcare, banking, entertainment, and transportation. All applications can benefit from the added features and the security that smart cards provide. Markets that have been traditionally served by other machine readable card technologies, such as barcode and magnetic stripe, are converting to smart cards.

First introduced in Europe nearly three decades ago, smart cards debuted as a stored value tool for payphones to reduce theft. As smart cards and other chip-based cards advanced, people found new ways to use it including charge cards for credit purchases and for record keeping in place of paper.

In the USA, consumers have been using chip cards for everything from visiting libraries or buying groceries to attending movies, firmly integrating them into their everyday lives. Several U.S. states have chip card programs in progress for government applications ranging from the Department of Motor Vehicles to Electronic Benefit Transfers (EBTs). Many industries have implemented the power of smart cards in their products, such as the GSM digital cellular phones as well as TV-satellite decoders. [18]

There are two general categories of smart cards: contact and contactless. A contact smart card must be inserted into a smart card reader with a direct connection to a conductive contact plate on the surface of the card (typically gold plated). Transmission of commands, data, and card status takes place over these physical contact points. A contactless card requires only close proximity to a reader. Both the reader and the card have antennae, and the two communicate using radio frequencies (RF) over this contactless link. Most contactless cards also derive power for the internal chip from this electromagnetic signal. The range is typically one-half to three inches for non-battery-powered cards, ideal for applications such as building entry and payment that require a very fast card interface. Two additional categories of cards are dual-interface cards and hybrid cards. A hybrid card has two chips, one with a contact interface and one with a contactless interface. The two chips are not interconnected. A dual-interface card has a single chip with both contact and contactless interfaces. With dual-interface cards, it is possible to access the same chip using either a contact or contactless interface with a very high level of security. [19]

3.7.5 Mobile payments

This is an interesting area and presents great potential for future of payments. Up to today, there are many ideas and real mobile payment systems have evolved, but still there is huge potential in this sector. The following chapters are dedicated to this topic.

3.7.6 SIM wallet

It refers to the smart card in the form of SIM (Subscriber Identity Modules). The idea of the smart card containing some kind of digital passport, which the operator allows other service providers to use, is particularly appealing. However, some types of service providers (for example banks) would prefer to have their own smart cards used in the second slot of enhanced handsets. This mobile passport has immediate application as a means to authenticate server-side wallets both for payment and identity purposes. [2]

3.7.7 Contactless payments

The contactless card needs only to be briefly passed by, close to the reader, for it to operate. In many cases, it does not need to be removed from a purse or wallet and sometimes would even operate while still in a bag or briefcase provided it is close enough to the reader. The distance depends on the type of device used; proximity devices would work up to 10 cm from the reader. Vicinity devices would work up to 1 metre from the reader. [2]

3.8 E-money mobile payment systems in the world

As mentioned in the previous chapter, there are many types of online payment possibilities. Forgetting the classic offline payment methods as cash on delivery or transfer from the bank account which are quite common in the Czech Republic, there are also other types of payments. Hugely expanded is online payment by card (e.g. Visa or MasterCard), banks also offer many payment buttons for instance eBanka by Raiffeisen Bank or mPeníze by mBank and last but not least are micropayment systems as PayPal or PaySec in the Czech Republic or also others in the world. Mobile payments are nowadays getting more and more interesting, not only for banks and operators, but even for the potential customers

because it is a requested “sound of the future”. Therefore, this chapter focuses on several mobile payment systems in the world.

3.8.1 M-PESA

It was launched in 2007 in Kenya by Safaricom, an affiliate of Vodafone. It captured quickly an important market share. It is a mobile phone based payment system with a network of agents involving retail merchants as well as airtime resellers. However, there are some limitations. M-PESA allows the performing of daily transactions to the maximum value of 70,000 KSH and maximum value per transaction is limited to 35,000 KSH. [20]

3.8.2 Obopay

Obopay was launched in 2005 in the United States. Again, it is a mobile phone based payment system. It is possible to use it anywhere in the USA, it is only necessary to know the payee's phone number. It is a requirement to create an Obopay account where the amount of money should be transferred. It could also be used while paying on the Internet. [21]

3.8.3 Margento

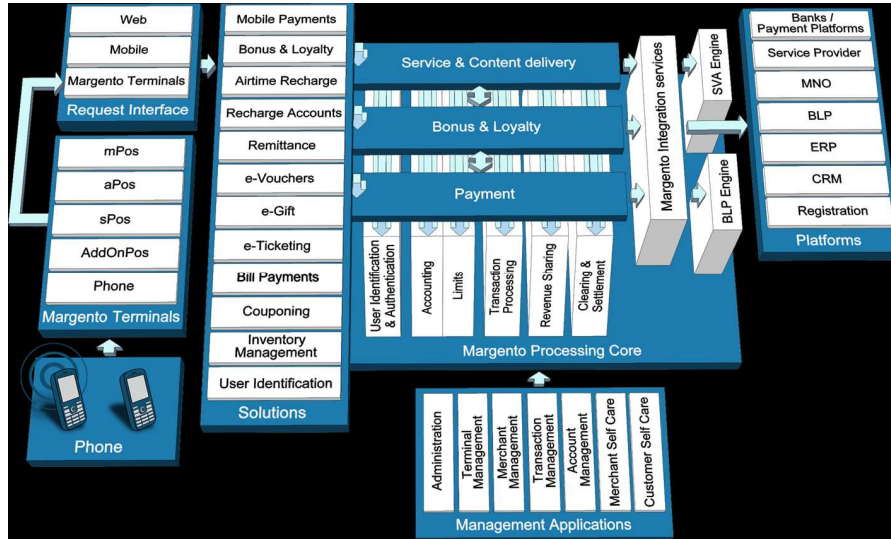
Margento was first known as M-Pay. Original, it was a Slovenian payment system run by ULTRA, which reportedly had about 150 thousand clients in Slovenia.

The Margento System is comprised of Margento point of sale / point of use equipment and back-end proprietary software (Margento Platform) that together, provide a secure connection to, in the case of payment, users’ accounts over existing mobile networks. It allows, for example, banks to provide users the liquidity of credit and debit products without the costs associated with the issuance and administration of plastic cards. The system supports different payment options – the user can charge a transaction to many different types of existing or new accounts (credit/debit bank accounts, stored value accounts, etc.). [22]

M-Pay, Ultra's mobile payment system, was first launched in Slovenia in 2002, but has since been initiated in more than five countries, including Japan. In September of 2003,

ULTRA signed a strategic partnership contract with Mitsui to penetrate the Asian-Pacific mobile telephony market with M-Pay. [23]

Figure 2. Description of Margento



Resource: <http://www.margento.com/technology>

3.8.4 Mobipay

The system was implemented in Spain in 2001, and despite the strong initial estimate it is spread minimally today and almost no one knows the service. The system was set up by the four largest mobile operators in cooperation with the banks, which are representing 80% of the Spanish banking market, and also with three card service centres.

Customer of the system performs an activation of the payment transaction using a mobile phone and a proper settlement of the transaction takes place in the banking systems. Mobipay is directly linked to payment cards or better to say the bank accounts of users. In the central system there is assigned a number of the credit card to a telephone number. For an authorization, each user has firmly placed a special PIN code. The system is based on the binding of the mobile phone number with the credit card number, with the IMEI (International Mobile Equipment Identity) of the mobile phone and with ID number of user.

When paying, the telephone number of the payer or his/her identification number assigned by the system Mobipay and is transferred to the merchant terminal. The central system

assigns a credit card number to the mobile phone number and then provides verification of the sufficient funds and the limit of the card, then notification is sent to the payer's mobile phone about the implementation of the payment transaction and then is waiting for confirmation by entering a special PIN code. The recipient (merchant) would then receive confirmation about the payment in the form of a transaction number. Communication of Mobipay is based on the gradual release of activation, authorization and certification messages. The system is directly linked to the user's bank account (respectively to credit card), which poses a risk of abuse. There are a large number of stakeholders with different interests and business structures in the system. Moreover, it is operationally expensive due to the transfer of authentication messages. Perhaps precisely for these reasons, it has not proved as very user acceptable and its expansion in Spain is negligible. [24]

3.8.5 mPay

mPay system has been operated by a Polish company in Poland since January 2007. The license allows you to carry out payment transactions using a mobile phone. The technology of the mPay system for the transaction is using one of two communication channels:

- USSD transfer mechanism for transferring data blocks of size of 182 characters with no storage (difference compared to SMS transmission)
- the voice channel with IVR interactive process.

In both cases, the processing of payment transactions synchronized connection between the user and the server of the system mPay takes place. In mPay there is no special application for controlling communication with the central system included.

Each user of the mPay system is identified by a unique mobile phone number (MSISDN). Each payment transaction requires authorization by PIN code and can only be activated by the payer. Responsibility for the correct date and a payment transaction is on the payer. Dealers for payment by the mPay system are equipped with a special terminal. In the mPay system there is only one universal type of payment transaction. Solution on the mPay platform supports C2C and C2B payment transaction types. There is no support for B2B. Merchants are not able to see the customer number. mPay system does not allow transfer to and from the client's bank account, and also does not allow cross-currency payments.

Process of payment transactions in the mPay system is divided into separate information stages. Firstly, the proper payment, then the information about the merchant, but in that time the payer has completed the communication link with the mPay system. Then a report comes to the payer's mobile with information about the payment. Participants do not have a permanent overview of the status of their accounts, it is only on request. By transport mechanism USSD user connects to the mPay system. Together with the code of mPay connection user has to enter a vendor number ending with a cross (example: * 145 * 123456 #). After checking the accuracy, the user enters the PIN number to confirm the payment transaction. The system confirms receipt of the request of the transaction and the user can then hang up. The system allocates the money necessary for the transaction and sends confirmation of the payment to the vendor. The user would also receive additional confirmation of the transaction with its bill. At the end of the confirmation may be a note from the merchant. [25]

3.8.6 Suica and EDY

These two systems both started in 2001 in Japan.

System Suica was designed as an offline pre-paid card for fare payment. Later, its functions were transferred to a mobile phone. It is based on the mobile application which allows barcode and square QR codes reading. It now also uses the NFC technology. [26]

System EDY is purely an online payment system with the mobile application. The system is dependent on a single mobile operator and is also supplemented by the possibility of small offline payments. It uses the NFC technology as well. [26]

3.9 E-money payment systems available on the Czech market

As mentioned in previous chapters, there are many payment systems on the market. Therefore, there were selected four main types for the Czech Republic, Internet banking as a service provided by banks, then especially contactless payment systems (NFC, PayPassTM), web based systems (PayPal, PaySec, Monetka, PayU) and the rest are selected mobile payment systems available on the Czech market.

3.9.1 Internet banking

It is one of the most popular methods of bank account maintenance. This service is offered by many banks, but the service can differ due to the bank. It is comfortable, but the main issue is security because it is based on the Internet. In the Czech Republic, there are several types of security possibilities used. The classic form is user ID and password, authentication calculator, authentication SMS or certificates of signature or even TAN codes are used by some banks.

3.9.2 NFC

Mobile phone manufacturers are developing new "smart phones", which should also include hardware and software solutions focused on the payment system, including its security. There are evolved technologies such as Near Field Communication (NFC) which is using chips for the identification of goods to be purchased and then paid. NFC operates in the wavelength band 13.56 MHz and its range is about ten centimetres. Except the transmission distance, it is similar to the widely used wireless Bluetooth technology. NFC systems are again particularly costly for the merchant because they require the physical reader and special purpose and records equipment at each point of sale.

The technology itself is not only designed for mobile payment, but also for identification for example. It can therefore be used instead of the smart card when entering the building and so on. At present, however, there are not many possibilities of the contactless mobile payments in Europe. Operators are still testing the service as yet. [27]

3.9.3 PayPass™

The MasterCard One Smart card is a contactless payment card. This is another kind of credit card, this time focused on both online and offline payments, respectively payments of small amounts without the need of authentication of the payer. PayPass™ is useful for quick payments up to 20 EUR for example in fast food outlets, parking, newsagents or public transport. Payment transactions use NFC (Near Field Communication) because cards are equipped by chip and antenna. Communication technology is similar to RFID chips. The system requires special readers on the sellers' side and the payer must be physically present in the surrounding area of the service provider, or better to say near the NFC chip reader. PayPass™ system is not equipped for the mobile payments. [28]

3.9.4 PayPal

PayPal was established in 1998, but in 2002 was purchased by eBay. Nowadays, it is one of the preferred online payment systems. The system can be used for secure Internet payments in the form of the payment button. PayPal offers three types of accounts – Personal Account, Premier or Business Account. PayPal accounts are directly tied up with the embossed credit card.

Basically, in this system, payment is by credit card which is hidden to a merchant on the other side of the credit transaction. So there still is some risk of abuse of both, the card and the account. In addition, PayPal is not strictly an alternative to a bank account, but it is only a tool to convert a payment transaction.

PayPal can be used without bond on a credit card, but at the cost of a significant functional limitation. Then, an e-mail address serves as login. PayPal is now also looking for the way to the mobile phone in the form of the mobile payment solutions directly from the user's account. [29]

3.9.5 PaySec

Preferentially, the system was created for clients of ČSOB and for online Internet payments with a number of restrictive conditions. Recharging the account can be done via transfer from a current account or credit card. When charging the PaySec account from the current account, it is not possible to use anything other than the tied current account. Essentially this is only a web application run on the mobile phone, via a standard browser. There is no application on the mobile phone which is connected with many disadvantages.

In fact, the charging of an account via credit card during a calendar week is limited by the amount specified in the tariff of fees associated with the use of PaySec. The account for merchants can be linked with only one current account. A current account can be tied up with maximally three PaySec accounts, so it also means that one current account can only charge up to three PaySec accounts. Generated date of the actual payment order is the actual date of payment entered by the user. Merchant as a payee can perform full or partial cancellation of received payments. The system requires authentication of the transaction by the payer via verification SMS for the payment above 2 000 CZK. A great advantage of

this system is that it cooperates with many companies for instance with aukro.cz, letuska.cz or with Student Agency. [30]

3.9.6 Monetka

Monetka.cz is a web purse run by Computer Press since 2002. It is the first company in the Czech Republic which obtained an approval with e-money issuing from the Czech National Bank. It is a payment tool, which allows Internet users easy, quick and without any fee or commission and also risk to transfer in particular small amounts for the purchases of goods and use of services on the Internet as well.

A user who wishes to use the purse has to establish it through a simple registration and then subsequently must fill it by money transfer which can be done immediately, for instance via internet banking. From that moment, the user can use it in the e-shops and places providing services that allow this method of payment. Realization of the payment takes about ten seconds and is not burdened by any fees or commissions, as is the case of a Premium SMS, and it is also possible to transfer an arbitrarily small amounts of money. [31]

3.9.7 PayU

PaU.cz is an online platform developed for e-commerce for both, the merchants as well as shoppers. The aim of this payment gate is to mediate easy, fast and safe online payments for goods and services on the Internet. It offers among others payments by Mojeplatby by Komeční banka, eKonto by Raiffeisenbank, mPeníze by mBank, credit cards VISA and MasterCard, bank account transfer or postal money orders. [32]

3.9.8 DZone

It is a combination of registered products, services and the possibility to pay via mobile phone. The mobile phone must have a special application installed that communicates with the central system. The system creates a list of service providers and vendors, sorted into categories (parking services, public transport, etc.), and the user then selects from the list of the payees. In addition, the payer must select the final product that he/she wants to buy off the final list of the products of the chosen recipient. This system is not universal and an unlimited number of users with unlimited number of products is not allowed. The DZone

system does not allow a user to purchase more products at the same moment. The user must make as many payment transactions as the number of products is required. [33]

3.9.9 T-Mobile and its m-payment

In the Czech Republic, there can be small payments collected by activated function (application) in the SIM card of mobile phone from T-Mobile paid as well. The payment transactions are made online by dialing a special code. It is a credit system, which is paid monthly as the part of the phone bill. This system is very limited, both from the user's point of view as well as its functionality. It is not a universal or multipurpose solution. [34]

3.9.10 Plat' mobilem

This is a project with three major telecommunication operators in the Czech Republic - Telefónica O2, T-Mobile and Vodafone. Within the APMS (Association of the Mobile Network Providers) the common web portal www.platmobilem.cz in October 2010 was launched. This covers two possibilities of payments. First is a classic Premium SMS and secondly is through the online payment gate of the operator on the Internet followed by confirmation of the transaction. It can be used for public transport tickets, parking, tickets relating to entertainment, digital music, books, DVDs or Internet gambling as well as for voting in any TV competitions. Till today, information shows that the mobile phone as a payment tool in the Czech Republic is used by 11% of the customers of the domestic operators which executes over 5 million transactions monthly. This is a sign that the Czech Republic is prepared for the mobile payment future. [35]

3.9.11 MOPET CZ a.s.

MOPET CZ a.s. was established in November 2010. This company has seven shareholders, important players on the Czech market - Telefónica O2 Czech Republic and Vodafone, Česká spořitelna, a.s., GE Money Bank, a.s., Raiffeisenbank, a.s., UniCredit Bank, a.s. and A-communications. [36]

According to the article in *Hospodářské noviny* from February 2011, a new payment method would be implemented during the year 2011. The shareholders of MOPET CZ – now Telefónica O2, Vodafone, T-mobile and those four banks are coming with the mobile payment solution in the form of an application in the mobile phone and the mini-account for the security of payments. The principle of this service is based on the notification of the

phone number when paying, then immediately a customer should receive the informing message with the amount paid and finally it is necessary to confirm it by the entering of the PIN code. The problem could be the transaction costs which would represent for merchants, the same amount paid for the use of credit card facilities – from 0.5 to 4 %. [37]

3.10 Comparison of the main payment methods used in the Czech Republic

The Czech Republic is a bit different when compared to the rest of the world regarding online payments as already mentioned. Abroad, it is normal that the majority pays online where it is possible, but in the Czech Republic this trend still has not gained popularity. The majority prefers to pay by cash on delivery or by transfer from bank account. These preferences occur most often when shopping on the Internet.

Regarding shopping in brick and mortar shops, the Czechs are still used to paying in cash and they withdraw from ATMs yearly about 600 billion CZK, which represents three times more than paying by credit card, although it is the widely used in the Czech Republic. For the three quarters of 2010, there was an amount of 141 billion CZK generated by credit card payments in the Czech Republic. Due to the estimation, the share of credit card payments in the total of payments made in shops represents roughly a quarter. [38]

However, this diploma thesis is focused on online payment systems. Therefore, on the other hand, there exists an easier way to pay by credit card which is suited or better to say unlocked for Internet payments. Credit cards are nowadays probably the most popular means of electronic payment and they are accepted by a vast number of traders. Credit card payments are fast and comfortable. It can be used for payments in brick and mortar shops as well as on the Internet. When paying online, it is necessary to physically have the card in hand by the payer to be able to fill in the credit card number, expiry date and the three last digits of the code printed in the signature box at the back which is called CVV2 code. In this case, the problem is a higher risk of misuse, unauthorized transactions if the card is stolen, which constitutes real danger of abuse. This is why people are afraid of online payments. Also, payers have doubts about the security of the portals when entering

“sensible” information. The vast majority of online card transactions are conducted through the independent payment gateways and reliable suppliers so data from the credit card are not shown to the merchant at all. Maybe the best payment gateway in the Czech Republic is 3-D Secure. On the other hand, there are also traders who do not use any secure gateways. [39]

PayPal is the most used transaction payment system in the world and it is also mostly used in e-commerce in the Czech Republic. The Czech Republic has a PayPal account at HVB Bank. Its owner is an American company PayPal Inc., which is owned by Internet auction website eBay Inc., which is headquartered in San Jose, California, USA. PayPal is almost essential for those who want to trade on eBay.com or trade online with U.S. citizens. [40]

Among advantages of PayPal belongs the fact that it works fast, it is reliable and relatively safe, establishing and maintaining an account is free and there are many PayPal users. On the other hand, as disadvantages could be considered that the user interface is only in English and also inability to transfer money to foreign accounts, also with the fact that the transaction fees for the payees are quite higher, from 1,9 to 3,4 % plus 10 CZK from each transaction according to the amount. There is also a high fee charged when there is a wrong recipient account entered. [41]

PaySec was created by ČSOB and Poštovní spořitelna, but an account could be at any bank. Application to PaySec is easy. It is necessary to fill out an online form, then to convert the money to the account and it is prepared for use. Account management, payment for the purchase and transfer from current account is free of charge. However, there is a payment for transactions via the payment button, which costs 3% of the amount paid in total. The recipient receives a reduced amount of the fee. It is not for Trade accounts. An additional fee is charged for debit cards, which is 2% of the amount put into PaySec account. If somebody does not want to use the service anymore, it is possible to convert the money back to the current account. Generally, it is called discharge. Discharge to account of ČSOB and Poštovní spořitelna is free. In contrast, discharge to another bank costs 2 CZK. PaySec allows payment in about 450 e-shops. The service is used mainly for Internet auctions, shopping, and sending of donations. The maximum limit for a single transaction is 50,000 CZK, while the account may have up to 100,000 CZK in it. However, if a payment exceeds 1,000 CZK, the system requires the payer to verify the identity via

SMS. The limit for confirmation of transactions can also be selected from 50 to 1,000 CZK. Therefore, to sum up pros and cons of PaySec, it can be mentioned that it could be used in quite a wide range of e-shops and easily charged from the account or credit card, but on the other hand there are charging fees of the account and it could not be used for bigger amounts than 100,000 CZK. [42]

3.11 Future visions - mobile payment system

Most recently, mobile phone payments are becoming increasingly popular. It is also the fact that people already prefer paying in electronic form, by electronic money. So as the progress is still in developing stages, it is clear that in the near future it will no longer be needed to carry paper money. Large companies such as Visa or MasterCard are developing new payment systems, but on the other side they fear as well as banks do, that the market might present a new product that was not developed by them, which would constitute a threat in the form of dragging customers away, either current or potential ones.

Currently, all products are popular such as Internet banking and pre-paid cards and credit cards, but the vision of using the mobile phone as a purse is very appealing. It will eliminate a lot of worries and responsibilities associated with daily wear of cash. Above all, most people carry mobile phones with them everywhere unlike for example the credit card. So it is possible today to buy a drink or a movie ticket or a ticket for public transport using mobile phone. SMS parking and public transport tickets are just based on the payment of the Premium SMS, which is a specifically charged text message.

Moreover, the latest information published by APMS (Association of Mobile Net Providers – a Czech association pursuing by micropayments as Premium SMS, Premium voice and mobile payment gates) stated that there is more than 1.5 million customers paying by mobile phone monthly, which represents more than five million transactions per month. During the last five years, there was an increase in the turnover of more than 66%. Another interesting bit of information is the guess about Premium SMS volume, which is alleged somewhere around 200 million CZK a year according to Michal Horák, chief executive of ATS Prague, a company which also deals with the Premium SMS. The use of

telephone banking as an additional service for Internet banking in the Czech Republic is also well developed.

Generally, there can be paid in several ways by mobile phone. Besides, most banks offer the possibility of controlling the current account and payment orders over the phone. In addition, Vodafone introduced so-called m-payments this year, which makes it possible to shop for contractors on the Internet and pay the monthly bill for telecommunications services. The future will bring the contactless payment technology NFC (Near Field Communication), where payment is made by placing the phone against a reader. However, the greatest hope in mobile payments of mobile operators and manufacturers of mobile phones is the NFC and contactless payments. They believe that mobile payments based on NFC technology can achieve the popularity of credit cards. Similar trends can already be observed in Japan. Their advantage could be in quick payments of small amounts as for example micropayments in parking meters. [45]

Beside the pre-paid cards, payment systems based on credit cards or the contactless technology, there are some applications being developed, which could be used as a mobile purse by which payment for anything can be made everywhere. This is not a utopia, but the near future. In some countries, it is already being used and is being prepared and evolving in other countries. One of the main problems could be the competitiveness and the size of market share of today's credit card issuers and other payment systems providers. The main questions of the future success of any of these systems are the costs, security and profit viewpoints.

Therefore, an important fact is that mobile phone payments are already working today and there are considered to be at least hundreds of millions of Czech crowns involved. Moreover, according to a study by Arthur D. Little, there will be massive growth - up by 68% annually in the next few years. In 2012, the amount of money paid by mobile phones can achieve in the world will be the equivalent of almost five billion CZK. There is awareness that the main driving force would be particularly emerging markets, where mobile phones are replacing less advanced cards. Even in a developed Europe, where non-cash payments are booming, the estimation of Arthur D. Little is about one-third of mobile payments for all completed transactions. [43]

There are however some problems in the communication between banks and mobile operators lasting years, mainly discrepancies concerning the role in the project of mobile payments with respect to followed-up earnings. Either they solve these problems or a new company with new technology will evolve, which could forestall them and leave them without potential huge profits. [44]

4 Implementation of mobile e-money payment system

4.1 Business and financial model of implementation of the SMP4U in the Czech Republic

The following chapter is focused on the business plan for the product SMP4U (System of Mobile Purses for You) in the case of implementation on the Czech market. Due to the scope of the thesis, only some parts are extended. Later follows the chapter with the questionnaire survey, which shows whether it would be useful to launch it on the Czech market.

4.1.1 Executive Summary

This is an executive summary of the business plan for the use of mobile phones and e-money in the system of mobile purses. The system was tested on a functional sample in order to verify all options and the quality of core payment transactions in real, online GSM network operation. The mobile purse system project is ready and developed to such extent, that its operation could be launched within eleven months of the start of implementation.

Authors

Authors and owner of the Czech patent are Ing. Hynek Siedek CSc. and Ing. Pavel Volf. They have proven their ability and experience in leading large-scale investment and technological projects, in building and managing companies and their strategies, in managing work teams and in addition, they have experience from the financial and banking environment.

Introduction

The system of mobile purses represents an interesting "start up" project with high growth potential. The value of implementation is 25 million CZK and the value of all investments in the form of registered capital is 35 million CZK.

The project in the starting period envisages with the grant of permits to operate small e-money under the Act 284 Coll. 2009 about system of payments, Title V, §§ 53-59. The mentioned Act results from the existing EU legislation supporting the e-money emitting and use by the EU Member States.

These especially include:

- European Parliament and Council Directive 2000/46/EC of 18 September 2000 on the business of electronic money, pursuit and prudential supervision of the business.
- European Parliament and Council Directive 2007/64/EC of 13 November 2007 on payment services in the internal market.

At the end of the year 2011, the project includes the application of the CNB (Czech National Bank) to grant a license called EMI (Electronic Money Institution) under the Act 284 Coll. 2009 about system of payments, Title IV, §§ 46-52.

During the initial informal presentation of the product in the CNB, the project was positively evaluated, it is free of defects in its formal and content concept for the CNB and it would not hinder it. CNB is prepared to grant on the request for a system of mobile purses in the first phase the permit, and then EMI license, the first in the Czech Republic.

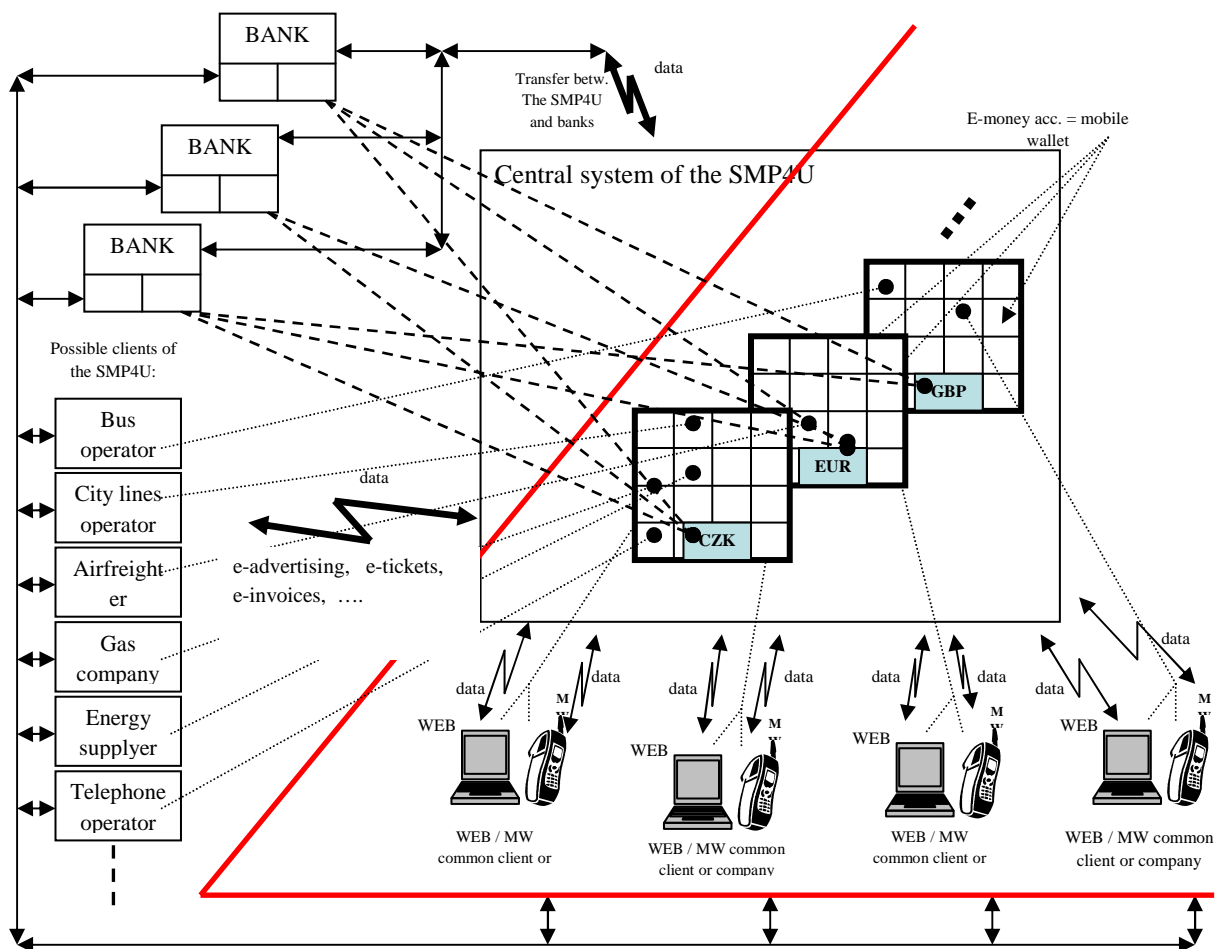
Project description

The project represents a new, secure real-time approach in solution to the various forms of payments by using e-money, operated by a special application installed in mobile phones. It represents a full-featured electronic money payment system - the payments are not limited by the amount paid (excluding statutory limits), nor by the payment execution time, nor by the place of payment, nor by usage of different currencies by the payer and by the payee, nor by personal or corporate bank account, or even by the mobile phone network

operator. The mobile purse system is able to process both debit and credit operations. Participants in the payment transaction are fully anonymous. The mobile purse system is completely different from products facilitating limited unilateral payments such as public transport tickets purchased via SMS.

Figure 3. Logic diagram of the System of Mobile Purses (SMP4U)

The system is closed from the customer's viewpoint, while it remains open for payment transactions.



Resource: Ing. Hynek Siedek, CSc.

The mobile phone in the system of mobile purses works as mobile terminal equipment and is only used to operate individual e-money accounts. The e-money accounts are kept in a secure central system. On the basis of the client instructions data given from his/her mobile phone, the central system effects transfers between e-money accounts (within the mobile purse system), as well as transfers between e-money accounts and bank accounts. The

mobile phone is fitted with a special application enabling payment instructions from the e-money account in the mobile purse system.

Limited operation of the system of mobile purses on the permit within the Czech Republic requires immediate transfer of money to e-money based on the fact that it does not allow a carrier to use e-money of a larger amount than 150 EUR in equivalent in every moment and the total amount of outstanding commitments would not normally exceed 5 million EUR in the equivalent and never exceeds 6 million EUR in the equivalent.

EMI license is then valid within the EU. Obtaining a license requires the establishment of joint-stock company, in which equity does not fall below 1 million EUR in the equivalent. Newly, a looser version of the Payment Systems Act is being prepared, where the acquisition of EMI license will not subject to a minimum equity of 1 million EUR in the equivalent, but only 350 000 EUR in the equivalent.

The commercial potential

Despite the problems with the actual state of economy, people will still have to do their payments. Contrariwise, the demand for quick and safe payments without risks and without the possibility of monitoring it from the payer to the payee is increasing.

In addition to payment coverage of the general population, it is also important for the mobile purse system to capture the payments in the business sector. It is further pronounced by a large number of entrepreneurs in the Czech Republic.

However, the mobile purse system project does not end at the municipality or territory nor at Czech borders.

Advantages of SMP4U

- Full substitution of paper money
- A simple operation with fast response
- The anonymity within a payment transaction
- The high protection of personal data

- A high degree of data security
- When mobile phone is lost or stolen, the risk of abuse is minimal
- The system is open to clients who do not own any bank account and have no credit card
- Unlimited time and local availability
- Low user and operating costs
- Online processing and review of all transactions including the state of use of the account
- The synergic support of the modern sales channels (Internet, DBTV, etc.)
- Possibility of use within loyalty systems
- A significant potential as a carrier of targeted advertising and marketing information

Revenue resources

Direct revenues:

- Transaction fees
- Monthly fees for maintenance of the applications
- Received interest from a running balance on the accounts of mobile purses

Other revenues:

- Charges for providing marketing information
- Charges for advertising space
- Fees for foreign exchange service

SMP4U includes

- Cash in CZK

- Cash in other currencies
- Internet banking
- Exchange office
- Debit card
- Credit card payment commodity (CCS, ...)
- ATM
- Telephone banking
- GSM banking
- Parking slot-machine
- Payment system for vending machine
- Payment channels for digital television
- Corporate coffers
- Electronic money (IN KARTA, Opencard, etc.)

Direct competition of SMP4U

- The issuers and operators of commodity credit cards (CCS, etc.)
- The issuers of single purpose or a local e-money (OPENCARD, etc.)
- The operators of city parking zones.
- The issuers of bank payment cards.
- The issuers of e-money and payment buttons for payments on the Internet.
- The operators of servers with electronic invoice payment systems on the Internet.
- The operators of mobile networks operating ad hoc mobile payments.

4.1.2 SWOT analysis of SMP4U and its circumstances

<p>Strengths</p> <ul style="list-style-type: none"> ▪ Independent multifunctional system ▪ Unlimited access ▪ Competitive advantages for both clients and vendor ▪ High security ▪ Anonymous system protecting personal data ▪ Low cost for acquisition and operation of the system ▪ Immediate display of the money available ▪ The system has a chance to become the standard ▪ High competing potential with bank accounts and credit cards (high fees for merchants), the possibility of future substitution ▪ High profitability and fast rate of return 	<p>Weaknesses</p> <ul style="list-style-type: none"> ▪ Entry to a conservative market ▪ A new company on the market ▪ Dependence on the existence and reliability of the GSM network ▪ Dependence on the Internet in the mobile phone ▪ Recharging of money from the existing bank accounts ▪ Different types of mobile applications for various types of mobile phones
<p>Opportunities</p> <ul style="list-style-type: none"> ▪ Widespread implementation of a new modern payment instrument ▪ Popularity and owning of mobile phones in the population ▪ The “need” of the mobile phone for young generation and entrepreneurs ▪ Synergies for connecting with modern sales channels (DBTV, Internet, etc.) ▪ Addressing to the young generation, e-shops, entrepreneurs, state sector and business companies ▪ Increasing market with the solution of micropayments 	<p>Threats</p> <ul style="list-style-type: none"> ▪ Competition of e-money or other mobile payment systems ▪ Fight for the market share with card companies and banks ▪ Fight for the market with products of GSM operators ▪ World recession ▪ The attack on the systems technology ▪ Strong trust to cash ▪ Resignation of the merchants to the new payment system

From this SWOT analysis results several risks marked as threats.

Competition of e-money or other mobile payment systems

In the Czech Republic, the issuers of e-money are fragmented according to the areas where they are limitedly able to find clientele. The issuers of e-money for payments on the Internet are in fact bound by their products to the specific banking houses. However, there was announced in February 2011 the launch of the new product by MOPET.cz in year 2011, which could prove some similarities with SMP4U, but the significant difference is mainly in the transaction fees.

Fight for the market share with the card companies and banks

The banks and card companies are used to a significant market share and would not want to lose any potential.

Fight for the market with products of the GSM operators

This state would at a certain stage of development of mobile purses on the market surely happen. The only possible elimination of attack is in a high-quality product with an inner potential of spreading, in a well-set business strategy and rationally prepared promotional campaign.

World recession

Despite all the problems with the ongoing recession people will still need to pay. On the contrary, there is an increasing demand for quick and safe payment without the risks and without the possibility of its monitoring from the payer to the payee.

The attack of the system technology

Technical and technological solution of the system of mobile purses uses a modern form of secure data transmission and by its architecture minimizes attack. The system calculates with a continuous internal depth monitoring.

Any collapse of the Internet should be treated by contract with the owners of mobile purses, like the banks treat with the risk for Internet and GSM banking.

There is also mentioned a threat of the strong trust to cash, which is proved that Czech people prefer the method of cash on delivery when considering e-business and the possible

resignation of the merchants to the new payment system, but this last threat should be minimized by the offer of low transaction fees and cooperation in marketing as well, which could be interesting for the merchants.

4.1.3 Financial models

The financial model was constructed with calculation of many factors put together into tables in three main variants – optimistic, realistic and conservative. According to the extension of this diploma thesis, there is only a conservative model presented. The main differences between these variants are the number of mobile purses and number of transactions made which were gained as the estimation of mobile purses in each quarter coming out from information available about the growth of users of similar products. These consist of press information and companies' information about using mobile phones for payment of public transport tickets and extensions of other commodity cards such as CCS. Similarly, when considering merchants' mobile purses, the same attitude was applied. It is assumed that approximately 10% of merchants would use this kind of payment instrument as its coffers. Mainly a smaller group of traders and entrepreneurs who do not want to pay high fees to the credit card companies and would like to have lower operating costs, especially to commodity cards such as CCS. The remaining 90% of merchants could use it as an instrument for the company's coffers in the sense of client and supplier relationship.

The financial model is based on the intuitive estimation of costs and revenues taken from information available. The external competition benchmarking method was used in the compilation of this model as well. Rate of inflation was set on the basis of the reading through forecast information for future years. The discount rate is decided to be 6 % which is rate plus risk premium. Real discount rate is calculated as nominal discount rate plus one divided by one plus rate of inflation and then minus one.

Indicators as NPV and IRR are calculated in this model and the profitability index represents the profitability of the project. In other words, how much could be generated by 1 CZK invested into this project.

$$NPV = \left(\sum_{t=1}^n \frac{CF_t}{(1+r)^t} \right) - I_0 \qquad 0 = CF_0 + \sum_{t=1}^n \frac{CF_t}{(1+IRR)^t}$$

NPV is calculated as PV minus invested capital. PV is a sum of CF divided by n-power of one plus r. In this case, to make the calculations more real, it is not powered, but due to inflation is discount rate different each year, thus it is multiplied instead. The project is feasible when IRR is at the same or higher level than the calculated discount rate.

Profitability index represents PV over invested initial capital. When it is higher than (or equal to) one, the project is feasible.

The project of mobile purses offers interesting results, where the levels of criteria indicators of NPV and IRR indicate the feasibility of the project. IRR calculation is based on iteration method, but it is also possible to count it from the formula when NPV is equal to zero.

Table 1. Financial model

CONSERVATIVE FINANCIAL MODEL - ECONOMIC STUDY (data without VAT) version: permit of ČNB + EMI					
	2012	2013	2014	2015	2016
Revenues from the operating of SMP4U	30 673 646	156 529 412	429 937 710	680 050 735	934 700 000
Income interest	243 083	1 160 332	2 919 233	5 721 895	8 257 319
Total revenues	30 916 729	157 689 743	432 856 943	685 772 630	942 957 319
Profitability (%)	-3	29	52	52	57
VAT base	33 867 349	90 678 261	163 559 975	246 829 748	310 993 674
VAT 20% (from 2013 19%)	-638 741	12 511 719	50 611 770	82 311 988	118 504 202
Investment costs	11 090 200	22 117 600	36 629 200	44 966 000	62 170 000
Depreciation	2 218 040	8 859 600	20 608 960	32 491 920	45 072 080
Promotion	6 500 000	20 000 000	30 000 000	40 000 000	40 000 000
Rent office fees, fees for patent use	4 263 273	18 851 396	51 885 463	100 297 699	137 611 480
Rent of HW,office tech.,purchase of office tech.s-l.dep.	7 882 000	18 424 000	26 894 000	34 242 000	35 238 000
Administrative, legal fees, consulting	1 100 000	3 000 000	4 000 000	5 000 000	7 000 000
Personnel expenses	6 854 100	33 808 200	59 174 400	92 661 000	114 489 600
Overhead costs	2 479 400	6 400 800	11 008 000	17 615 800	23 316 600
Cost reserve	552 476	1 884 464	3 143 312	4 708 249	5 657 594
Interest 6% p.a. from principal	0	0	0	0	0
Total costs	31 969 289	111 609 261	207 190 135	327 730 668	409 099 354
Profit / loss btto	-1 052 560	46 080 483	225 666 808	358 041 962	533 857 965
Accumulated revenues	30 916 729	188 606 472	621 463 415	1 307 236 045	2 250 193 364
Accumulated costs	31 969 289	143 578 550	350 768 684	678 499 352	1 087 598 706
Accumulated profit / loss btto	-1 052 560	45 027 922	270 694 731	628 736 693	1 162 594 659
Tax (20,19,19,19,19%)	0	9 105 744	42 967 134	68 163 633	101 568 673
Costs tax ineffective	120 000	380 800	476 000	714 000	714 000
Net profit / loss	-1 052 560	36 974 738	182 699 675	289 878 330	432 289 292

Resource: Own calculations

The following criteria indicators are objective due to calculations based on real data gained as real CF (inflation considered) without current liabilities.

In case of the EU expansion, the models would be due to the nature of the market similar to the revenues and costs, as well as number and the growth rates of registered mobile purses. It could then be simply calculated as the launch in X states as an approximate X times the revenues and costs of the Czech business model, taking into account the time lag in other states.

4.1.3.1 Operating revenues and receivables

Real revenues are directly dependent on the quality of the estimate of the average number of registered mobile purses and on the estimate of the number of transactions as already mentioned above. Significant facts for achieving the projected revenues are properly set rates per transactions.

In the conservative estimation, operating revenue would be in the year 2012 at around 31 million CZK. Revenues interannually show a significant jump up to the modelled level of 943 million CZK in 2016. Taking a conservative estimation, system counts after 2014 with symptoms of market saturation and growth of registered mobile purses is deliberately subdued. Modelled growth represents a prerequisite of maintaining costs for promotion.

Key importance for the development of e-money purses would be to obtain the largest retailers (supermarkets, petrol stations, payments by state and local authorities, other e-shops) and massive targeted advertising. At the beginning, the critical number of purses would be 50,000 registered mobile purses. It can be assumed that for successful implementation of the product into the Czech market the first year of its operation is crucial.

An important factor that affects the success of the introduction and expansion of mobile purses is its promotion. The target group for the system is citizens (with a focus on the group aged between 10 to 40 years), businesses (entrepreneurs), state and local authorities and large retail chains. There are also marketing issues calculated in the model.

The model also calculates with the saturation of the market at a relatively low number of candidates after 2014 by the sale of advertising and marketing information so that the interest would show each eighth merchant (assuming that 50% of clients who would buy marketing information would also purchase advertising space). Due to the nature of the product, it is perceived as an advantage zero receivable for customers.

4.1.3.2 Financial revenues and current liabilities

A significant portion of revenue from ordinary activities represents interest revenues. Its value is composed of two parts. These are the interest of operating account and partly from the interest of balances of mobile purse accounts. Since there are no plans to interest bearing client money, there could be interesting amounts set by the continuous balances on the clients' e-money accounts. Estimation of average continuous balance also due to the number of business mobile purses is again conservative, ranging from 300 CZK in 2012 to 1,000 CZK in 2016.

These advances are in the early years comparable to operating revenues so it could be guessed that they are modelled at the level of one percent of the annual amount of money handled by the system of mobile purses. Other current liabilities compared with the continuous advances on the e-money accounts are negligible. When designing the model, trade payables were considered with a due date of 30 days. These mentioned balances represent a significant ongoing short-term other sources in the balance sheet. Because the company would operate a system of e-money under license of CNB, these funds could not be used for any investment operations, except the classical bearing interest.

4.1.3.3 Profit

In its second year of operation, there is a fair forecast of gaining a profit. It embodies since 2014 within the Czech Republic above average profitability. Business models do not cover all possible sources of revenue that the system of mobile purses could generate. A significant volume of sales could be obtained from operating noncash electronic foreign exchange activities or from any proper sales of goods and services and the administration of consumer credits using a system of mobile purses. This depends on agreement with an investor as a strategic way, which the operator of the system would take and how it would expand its activities in the future.

4.1.3.4 Investment

Because the project belongs to the hi-tech projects group and is dependent on the quality of its technical equipment, the financial model counts in the acquisition of the necessary software and hardware investment (local area network, office software and acquiring of ERP including databases Oracle Standard). Furthermore, an investment into the redevelopment of offices is listed, although in terms of building leased premises, this item

is included in the depreciation schedule because it is a marginal amount. In the case that the agreement with the landlord of office space would be possible, it could decrease the rent (operating costs) in the first years of the lease by the invested amount into the reconstruction work of the office.

The ERP system must be able to ensure the processing of large data files transferred from the application server, it must be able to communicate with the interface software of banks and it must be able to provide operational and strategic reporting. It should be sufficiently robust, secure, and if possible, respected not only by the Czech auditors.

The business plan for processing the financial model calculates with the deployment of Microsoft Dynamics NAV as ERP and for customer service supposes the use of outsourcing. This option comes out capitally and operationally acceptable while maintaining necessary quality.

In the first year of operation, the investment is planned at 11 million CZK and in the next two years, the investment is growing by about 100% of 2012. Between 2015 and 2016 due to the technological saturation of the product, the growth of investment would increase by 30% annually.

A straight-line depreciation was used and the investments are generally classified as the first depreciation group with a depreciation of 36 months. The question of depreciation of the investment into research and development was not dealt with in this business plan. The business plan does not deal either with the possibility of using EU subsidies. However, there could certainly be found some operating program under which such subsidies could be used with a benefit.

The system of mobile purses, SMP4U, is a proper developed and implemented investment. Investment costs for its development and implementation are approximately 25 million CZK. A detailed breakdown of the costs for development and implementation is given in the supplements. There is also cost reserve for setting the Call Centre with a partner or possibly for the own solution.

4.1.3.5 Operating costs

There are four main groups in the financial model of operating costs. These groups are personal expenses, operational leasing of application, office hardware and office equipment, overhead costs and promotional costs. These groups come from the business activity. Providing services in a mobile purse system implies the need for purchases, the development and retention of quality staff, acquisition of sufficient and quality technology, including the development and maintenance of software applications (assuming the development on the own account, the business plan does not deal with the question of development awards, so this item does not appear as an asset), and finally the purchase the advertisement for new product presentation. The plan envisages 12 monthly salaries a year, but it is obvious from the model that there would be nothing restraining to add the 13th and 14th salaries and in addition to increase quarterly and annual bonuses.

The organizational structure would be hierarchical, with an emphasis on horizontal linkages (3 levels of management). The management of the company is represented by the CEO and divisional managers. The joint-stock company would be formally organized into six substantive departments: Secretariat of the CEO, Finance department, HR department, Technical department, Internal audit department and Business department with the PR and marketing divisions. Company occupancy would be based on an analysis of needs of the product and the viability of the company, including legal communications with the state and the regulator (CNB). In 2012, the total of employees would be 21. In 2013, the further 20 employees would start working for the company to bring the total to 41. In 2014, another 19 employees could start totalling 60. Also in 2015, 22 employees could start to make the total number 82. Finally in 2016, the total number of employees could be 94. Personnel expenses are considered in the financial model.

The project does not consider a loan, since there is not possible to use the loan according to conditions for granting and maintaining EMI licenses regarding legislative condition to maintain minimum obligatory equity. Therefore, the financial model does not deal with the cost of interest.

Rent, service charges and office space per employee are based on experience with the placement of personnel, the planned area for an employee, with the cost of services related to rent and price of the rent and its development in the context of the recession. Similarly,

the estimate of the cost of furniture (simply depreciated) for employees and the average price of operating leases for office equipment on average per employee is taken from the Internet survey.

The price of the operating lease of hardware for application of system of mobile purses, the ERP installation and use of office software products are based on a commonly used model, built on the purchase price of equipment, the lessor's margin and the depreciation period. The estimated price is also including the back-up robot.

Likewise, the price for the lease of sufficient communication links is relevant the current market and its supply. The price for legal services and consulting and administrative fees require only a partial dependence on external suppliers. The price includes the assumption of certain legal defence in business. The price of energy, water and sewage charges is estimated, taking into account the growing needs of the company especially with electricity consumption.

Estimated cost of the settings of ERP is again based on the survey of current market. Price for outsourcing of the client centre (Call Centre) is also oversized, and the model is based on the number of employees of the operator of SMP4U. In fact, except the year 2012, the number of adequate staff would be half in the client centre.

Costs planned to start the campaign and expanding the maintenance campaign in the conservative scenario of financial models assume more gradual use of local places (flyers) with the support of selected broadcast radio stations and the press. Later on the model counts in limited television promotion. Within the costs of promotion, there are also planned personnel expenses. The agreement is whether the investor could help with its promotional campaign (e.g. connection of information to existing television and other advertising).

The level of overhead costs corresponds to the common standard. The operating costs also include a gradual liability insurance increase and the general insurance of company for the amount about 40 million CZK in 2012 to the amount of 400 million CZK in 2016 assumed the insurance provided at 3% of sum the insured).

Number of cars, its purchase as operating leasing and its operation corresponds to the number of employees and their activities outside the company headquarters. Operating leasing in this case is better than a team of dedicated staff to keep the car fleet. The operating costs are even more symbolically set to be tax ineffective and cost reserved, which again underlines a rather conservative estimation of the costs for the start and operating of the company.

4.1.3.6 Investment evaluation

In the financial model there are the results of an investment evaluation for the decision of investor of selected indicators as well as the results of an analysis of the feasibility of the project for investors using criteria indicators as NPV, IRR and Profitability index.

The general characteristics for the values determining the criteria indicators, there was dealt with the reaching of nominal cash flows in each year, the estimation of inflation from 2012 to 2016 and the nominal discount rate, where the value was set at 6% throughout the period as already mentioned. For the real indicators for the values determining criteria indicators the same data sources were used, but the achieved nominal CF was decreased by current liabilities (2012-2016). This step is more realistic, due to EMI's licensing conditions, there is no other way to treat the advances of the owners of mobile purses rather than leaving them in bank accounts. The only thing that these other sources bring to the operator is the interest on revenue. Advances of the owners of mobile purses are an essential part of current liabilities. Liabilities to employees and to the state from the perspective of investing are not essentially possible. Liabilities from the trade relationships are a marginal item in the total current liabilities. Therefore, when determining the real values of criteria indicators there was a reduction by a nominal value of CF for each year by total current liabilities and also inflation was considered.

Table 2. Project feasibility

ANALYSIS OF THE PROJECT FEASIBILITY									
year	infl. estimation %	real DR %	1+i	1+r	nomin. CF	nomin. CF without short-term liabilities		real CF	real CF short
2012	2,70	3,21324	1,027	1,03213	30 931 533	30 301 550	629 983	30 118 338	613 421
2013	2,90	3,01263	1,029	1,03013	103 970 445	93 118 993	10 851 452	98 383 911	10 268 382
2014	2,50	3,41463	1,025	1,03415	303 860 201	165 178 429	138 681 772	280 520 198	128 029 396
2015	2,50	3,41463	1,025	1,03415	635 872 937	252 172 375	383 700 562	572 712 672	345 588 185
2016	2,00	3,92157	1,020	1,03922	1 093 253 796	331 251 746	762 002 050	965 355 495	672 856 449

Resource: Own calculations

Table 3. NPV, IRR

year	PV short	Registered capital-cash	NPV short (cash+inv.for dev.)	IRR short (cash+inv.for dev.)	profitability index short
	-	10 000 000	-	-	
2012	594 324	-	-34 405 676	-98,25	0,02
2013	9 657 753	-	-25 342 247	-45,84	0,28
2014	116 439 890	-	81 439 890	54,08	3,33
2015	303 926 784	-	268 926 784	77,26	8,68
2016	569 412 260	-	534 412 260	80,62	16,27

Resource: Own calculations

IRR in the year 2016 represents 80,6 % and NPV 534 million CZK. These are the values for amounts without current liabilities which represent money in the accounts of the mobile purse owners.

The break-even point was calculated as $TR = TC$. According to analysis of costs and profit, there were specified fixed and variable costs. Variable costs per mobile purse were set as variable costs divided by total revenues over revenue per mobile purse. Price for mobile purse per month multiplied by 12 months is revenue per mobile purse. Finally, break-even point is in this case considered as $(FC + VC) / \text{revenue per MP}$. It means that for example in the year 2012 there should be activated 27568 mobile purses to cover total costs and more is needed to generate profit. The rest of results are in the following table.

Table 4. BEP

	2012	2013	2014	2015	2016
FC	25 235 189	78 181 861	148 491 735	235 783 668	295 323 754
VC	6 854 100	33 808 200	59 174 400	92 661 000	114 489 600
VC per MP	310	458	473	524	520
Revenue per MP	1396,80	2134,80	3457,20	3874,80	4282,80
Revenue per MP - tax	1 164	1 779	2 881	3 229	3 569
BEP	27 568	62 951	72 081	101 717	114 826

Resource: Own calculations

4.1.4 The project description

Basic product description is in the Executive Summary, therefore it will not be repeated. The brief look into the project and system functions as a whole is preferable in this chapter.

Among the various types of payment, system of mobile purses provides space for paid advertising, direct marketing, the acquisition of marketing information for a set fee and provides a platform for usage in loyalty programs.

Both parties of the transaction are informed online about the status of the transaction. The payer and the recipient see a decrease immediately after the transaction, or increase in the status of e-money by said amount. Participants in the transaction also instant access to the necessary evidence of the payment. The viewed e-money amount online in the system of mobile purse directly means the money available at that moment.

Each mobile purse would be charged a monthly fee for maintenance. Each month, for example, may be the first five transactions and confirmation of receipt of each mobile purse set fixed fee of 1 CZK, which could be the incentive rate for the client to actively use his/her mobile purse and to minimize the average monthly fee per transaction.

The system of mobile purses could be used for payments as well as in shops as on the Internet, money could be transferred between mobile purses as well as to bank accounts, mobile purse could be also used for cash withdrawals, payments for postal money orders and invoices. Within these types of payments, there could be implemented a number of specialized payments such as payment for parking, for public transport tickets, for flight tickets, for tickets for sport or cultural events, for the recharge of a mobile phone credit, there could be remote payment for another person too and so on.

There is no limit to the number of mobile purse established in a mobile phone and it is not limited to any currency. One mobile phone could have several mobile purses in different currencies. There could be personal and business mobile purses in the same mobile phone. Furthermore, there is a possibility of the foundation of special mobile purses for payments for goods and services which are limited by age of the owners of mobile purses.

The system of mobile purses does not require any special recording or reading devices by merchants, but only their regular mobile phones or access to websites (cash, PC). The

system could be linked with existing cash register systems, thus simplifying of the payment process and registration for a merchant.

E-money could be charged to mobile purses from bank accounts by money transfer order, postal order, collecting demands, as a transfer from other mobile purses or a cash deposit within the mobile purse system.

Mobile purse could be created by registering on the Internet, on the mobile phone, through the Call centre, in person or in writing. There would be a special mobile phone application made available freely on the web. There are active and passive possibilities of using the mobile purse. Actively, it means to perform a payment transaction and passively is to trace the transaction history, to manage administration of mobile purses or to monitor the status of the transactions. In addition, it is possible to check each mobile purse through the web application.

The principle of the mobile purse system works on the basis of data transmission over the GSM network. There is almost 100% coverage by the networks in the Czech Republic and the EU. Telecommunications Act prohibits operators under penalty to block data transfers of any party, whose conduct does not violate this Act.

Any mobile phone that could transmit data and has the ability to upload and store the mobile purse application via the Internet would be sufficient. Nowadays, these conditions would be fulfilled with almost every mobile phone sold. Any purchase of a new mobile phone means potential customers.

It is important to realize that this product could be especially interesting for the young and middle-aged population, and these people have their mobile phones connected with all daily routine activities.

There are tests and verifications of the basic principles and functions of the system on a real functional sample of more than a year, which also includes server solutions and applications for mobile phones. The application is installed on five different types of Nokia mobile phones. Up to now the experience is positive and demonstrates the principle and also the solution to be fully viable and user-friendly.

For rapid development, particularly in the first year of commissioning the system would be useful not only to use ordinary employees, but also external partners. The operator could be in different locations backed up by a suitably motivated vendor of mobile purse, the students and eventually retired as a bearer of fundamental advantages over ordinary workers (costs, liabilities, etc.).

4.1.4.1 Characteristics of the product SMP4U

The system of mobile purses is an interactive mobile e-money system based on a closed network of customer e-money accounts held within the bank accounts of the system operator.

As already mentioned, the mobile phone in the system of mobile purses operates as a terminal device and is used for the operation of the individual e-money accounts. Private e-money accounts are kept in a secure central system. The central system ensures both transfers between e-money purses, as well as transfers between the system of mobile purses and the bank accounts, based on the instructions of the client from his/her mobile phone. To control the mobile purse, a mobile phone should be equipped with a special application.

The central system would allow the users to make payments for goods and services to the others clients of this system securely and easily, without any time and locality restrictions.

The system is based on the use of existing GSM networks (data communication application layer). Interested parties act to each other completely anonymously, as it is in cash payments. Information about users are separated from the proper e-money account. There was a simple, safe and fast intuitive graphical interface developed to control e-money from a mobile phone.

It is a safe, easy, fast, operationally independent, multifunctional and a universal payment tool! The system of mobile purses disposes the client of worries and problems associated with credit cards or e-money.

The system of mobile purses provides online information on their immediate e-money balance and also transactions made for any period. It also allows the display of the

payment and any other documents tied to the payment transaction, such as public transport e-ticket, flight ticket, other different tickets, etc.

The system of mobile purses is able to act as a classic purse, but also in addition, it provides the option to pay in the form of transfers within the customer accounts and beyond them. It is suitable for traditional business and the Internet or DBTV. It also allows payments using internal online exchange office. E-money account is not linked to any credit card or bank account of the owner of the mobile purse.

The basic menu on the initial screen offers functions as the foundation of a mobile purse, payment transactions, and other functions in the main menu. The function foundation of a mobile purse allows the immediate creation of the new mobile purse, either directly from a mobile phone at the application of the system of mobile purses, or from the mobile purse operator's website. This function calls a registration questionnaire with all the attributes needed to set up a new mobile purse.

4.1.4.2 Payment operations in SMP4U

- Payment – the payer enters the e-money recipient's number of the mobile purse and the amount paid, the same data can be specified by the recipient as expected reimbursement
- Payment with specification - the payer enters the same data as in function Payment and in addition the number of goods or order, the same data may enter the recipient as expected reimbursement
- Cash withdrawal - the payer enters the number of mobile purse to which transfers an amount equivalent to the withdrawn cash
- Cash deposit – the recipient of cash enters the number of mobile purse to which e-money will be transferred and the value of the deposited amount in cash
- Transfer to other MP – the sender enters the recipient mobile purse and the value of the transferred amount
- Transfer to the bank account - the sender completes a classical electronic payment order

- Advice payment- in fact it is a sophisticated form of Payment with specification and after the selection of Advice payment the payer confirms the reimbursement of selected amount to the set mobile purse, the payer can see to who and for what he/she pays and also the due date

It is possible to determine the target currency, in the all payment transactions mentioned above, in which is exposed bill or in which is required the cash withdrawal or to deposit cash, or for which the transfer is made (both types) or in which is advice paid. Payment transactions are active only within the application on the mobile phone. There cannot be any payment made from the website due to the security precautions.

In addition to payment transactions, the proprietor of mobile purse could use a range of other functions. All other features are the owner of the mobile purse accessible from mobile phone, the Internet and through customer service.

Especially for the merchants, respectively the beneficiaries, is available a function for the monitoring of income. This function is used for real-time monitoring of the payments made by the counterparty and it is possible to monitor any payment transaction (except a transfer to a bank account). Monitoring of income is available both on the mobile phone and on the Internet, where it is possible to print it out.

Function messages enables the owner of the mobile purse to receive and open messages - advertising, forms, advice on the mobile phone and on the Internet, where it is possible to print it out.

The statement of transactions function enables the owner of mobile purse to track the history of movements on account of electronic money on a mobile telephone and the Internet, where the option of printing history is available.

The lock function is used for initiation of the application in the mobile phone into the standby mode. To end standby mode of mobile purse, the owner enters the PIN of the mobile purse (the string of numbers belonging only to the lock function). By entering the PIN, the mobile purse goes from standby back to normal operation.

Function setting of mobile purse includes:

- Settings of favourite mobile purses (number, owner, etc.)
- Blocking of mobile purse functions is used to selectively block the possibility to carry out payment transactions and set, respectively, change the parameters of other functions (change passwords, payment, payment with specification, withdraw cash, deposit cash, transfer to another mobile purse, transfer to a bank account, advice payment, change of PIN)
- Filter settings for the statement of transactions is used to select and set the parameters under which the transaction will show the statements. Filters of the mobile purse in the mobile phone and on the Internet are independent. It is possible to change the time interval of the statement, statements could be filtered in the range of amounts, the statements could be chosen according to type of payment transaction, receiving or vending transaction, the last day, week or month
- Change Password allows owners to change the password of mobile purse, the same password is used for access as well on the Internet
- Change MP PIN allows the owner to change the mobile purse PIN for the lock function
- Timeout setting enables the owner of the mobile purse to set the idle period after which mobile purse, respectively applications in the mobile phone, automatically turn off
- Application Update facilitates the procedure of easier uploading the current version of mobile purse into the mobile phone

A help function is standard.

Special function which is accessible for the owners of mobile purse from the Internet or through customer service is a function to block movements and monitoring of e-money account.

4.1.5 Technology

The DEMO version was developed which is described in these following chapters.

4.1.5.1 Software architecture

The system consists of several layers. In the client part it is a client application for mobile phone and web-based application that users could use through a web browser. The operation of these applications is provided by the respective web servers. Proper logic of the system (management of e-money accounts and related data - such as personal data) is provided by application server. A database server serves to the data storage. The application server also provides the data streams leading out of the system, it means to systems providing links to the core systems (bank data interface for transferring money to / from the system, a data interface of a mobile operator's SMS gateway), eventually to the systems of other partners providing specialized services (e.g. advice payment for services, public transport tickets, etc.).

4.1.5.2 Mobile client

The mobile client consists of applications that users could download and install on their mobile phones by themselves or it could be downloaded by the set operator. It is necessary to activate the application after downloading. It is possible to consider the creation of various forms of the applications that could be based on Java or may be integrated directly into the mobile phone operating system (such as Symbian applications), or other supported devices (PDA, etc.). Mobile client demo version is implemented in Java (J2ME).

A necessary condition is that the user has access to the mobile Internet (via GPRS / EDGE, or eventually dial connection through CSD). On the website of the operator of mobile purses, should be an application available to download for free to all interested parties in the language of the set country. The vast majority of mobile phones that support running applications written in Java is able to work with this application. The program does not use any special features tied to a specific type of mobile phone so it is possible to use it on all mobile phones supporting the set Java version and have set the profile MIDP 1.0 or higher (the Java Mobile Information Device Profile), which fulfils the vast majority of today's mobile phones.

Standard HTTP connection is used for communication (this is the most feasible in terms of structure data networks used by mobile operators for connecting mobile phones to the Internet, because it corresponds to a mobile phone communications commonly used, such as Internet mobile browser or wap client). The data transmitted by HTTP connection is encrypted at the application level.

4.1.5.3 Web client

To access the e-money account via the web interface would serve a classic web application. This interface would be used for service capacity, such as activation of mobile phone application or to obtain overview information (e.g. transaction statements of received payments) in a clearer form than would be possible on a mobile telephone or for printing as well. The application would run in a common web browser (Internet Explorer, Mozilla, etc.), the communication would be done using the https protocol (with certificate only on the server side from the certification authorities such as Verisign, I. CA, etc.).

To increase the security of authorization, in addition to the normal login by number of mobile purse, username and password, the sending of a confirmation code by SMS or eventually a code sent via the mobile client.

4.1.5.4 Web client of client service (Service desk)

Support (hot line, resolving complaints, etc.) would have an application where the information needed to resolve problems or requests of individual clients would be available. For this purpose a web application would be available only in the workplaces of support.

4.1.5.5 Web servers

In the case of web applications (web-based e-money accounts, service desk applications) the application runs directly on the web servers, in the case of a mobile client, special application runs on the web servers intermediating data and the communication interface for application running on a mobile phone. The owner of the mobile purse is allowed to passively access the e-money account through a web client. All e-money accounts are physically realized by a real bank account (group of accounts), which manages the operator of system of mobile purses.

For applications running on web servers, Java / JBoss would be used, using large libraries and infrastructure which this platform offers. Applications would be developed with regard to scalability and the possibility of using clustering.

4.1.5.6 Application server

At the centre of the whole system is the application server. There is the management of e-money accounts and all transactions related to it and also all supportive systems are located here. The application server would be built on the same technology as web servers (Java / JBoss) with respect to scalability and possible use of clustering included. Communication with it would be implemented in a uniform interface common to all functional blocks, which uses its services. Firstly, it separates the logic of operations conducted by the various e-money accounts from the logic of access interfaces, and secondly, it would allow the addition of other client layers either from other access interfaces for system users in the future or in the form of automated links to external systems (e.g. electronic coffers). Communication between web servers and the application server should be conducted on the trusted local network, and therefore it is not necessary to solve its security by encryption at the application level.

4.1.5.7 Database server

For the database server Oracle is the expected technology used. In addition to data storage there should be dealt with the questions of database back-up and its subsequent recovery in case it is needed. It also shows that all relevant data in the system necessary for its reconstruction should be stored on this database server. In terms of communication, the exchange of data between the application and the database server would be conducted via an interface (driver) JDBC. Regarding security, there are the same rules applied as for application servers.

4.1.5.8 Data interface of banks

The whole system must be connected to data interfaces, which convey a two-way access of real money flow to and from the system of mobile purses.

4.1.5.9 Mobile operator's SMS gateway

For sending SMS messages, it would be necessary to sign a partnership with mobile operators. They would then convey the data interface for sending SMS's (solutions using GSM modems are useless on a larger scale).

4.1.5.10 Problem of security

The security of the system is dependent on many factors. The main ones are:

- Technological solution of data communication
- Technological solution of proper application
- Organizational solutions of the operation of the system
- Identification elements used

The owner of the mobile purse is identified in the system of mobile purses by:

- Number of mobile purse (10 digit number).
- Login name (alphanumeric characters).
- Password (alphanumeric characters).
- Possible non-periodical confirmation string sent to the mobile client.

In terms of security, it is appropriate that the individual functional blocks or its groups be conducted on separate computers. This has several advantages:

- Successful attack on any of the "borderline" servers associated with the decommissioning would not automatically cause malfunction of the inner layers of the system and for this purpose there could be backup server prepared.
- Individual servers could be linked by a network infrastructure that releases only the data flows necessary for the operation of the system, thereby reducing the possibility of subsequent attacks on the inner part of the system.
- On the "borderline" servers only a minimum of sensitive data is stored.

The disadvantage is obviously greater demands on the installation, maintenance and monitoring of the system.

In terms of routine system monitoring and the analysis of potential attacks on security of individual functional units, it is important to keep track of all transactions, which carry different functional blocks and of the data which flows from it. Therefore, a sufficiently detailed log must be available for each application and each data interface with information about the transmitted data and conducted transactions. There must be a policy of managing these logs, eventually a system of routine analysis focused on detecting anomalies in system behaviour. Logs must be retained long enough to be useful for retrospective analysis of system operations in case of any suspected security incident.

Logging should be done at two levels. The "high" level would deal with creating a record of all transactions carried out in the system at the level of e-money transfers between mobile purses or eventually purses and the "outside world" (a similar survey would be available to the user through a web client for his/her purse, but it is suitable to have a central log stored separately). Long-term storage for this data is expected. The "low" level would be for a detailed "technical" log with data transfers of data between functional blocks, used for the technical analysis of potential problems. The required time of storage of this data would be shorter.

Personal data of the owner of the mobile purse would not be stored in the application on the mobile phone. E-money accounts are protected by a number of identification elements entered by the owner, but there are also other identification elements associated with the activation of applications on the mobile phone used. If the mobile purse is blocked by the authorized owner (theft or loss of the mobile phone), it is possible to activate an application in a new mobile phone and re-establish access to the original e-money account.

4.1.5.11 Hardware architecture

Throughput of the system would be set around 10,000 transactions per minute (payment, confirmation and information transaction between the mobile client and application server). The application in the mobile client actively calls the central system.

4.1.5.12 Internal communication channels

Communication between web and application servers and application servers themselves would be conducted on the trusted internal network. Security could eventually be increased "passively" so that the interconnection network structure would contain elements with operation filtering (firewalls, smart switchers with packet filters, etc.) and restrictions of communication between servers only for data streaming of the system.

4.1.5.13 Internet communication of mobile client

HTTP would be used to communicate over the Internet. Because the data transmitted by this protocol is not encrypted, this issue must be solved on both sides by the relevant applications (application in the mobile phone and application on the web server). Encrypted data would be transmitted inside the HTTP communication. For this purpose, a combination of symmetric and asymmetric ciphers would be used. Asymmetric ciphers would be composed of a pair of keys (private, which would be stored on the server and the public, which would be downloaded by the application on the mobile phone). The pair of keys would be changed regularly and would be unique for each mobile purse.

4.1.5.14 The process of establishing a mobile purse in the system

Each mobile purse requires contractual arrangements between the operator of mobile purse and the owner of mobile purse. The contract would be implemented within the mobile purse registration process. Registration would be done by entering personal data of the owner of mobile purse, either in person or by remote access. Registration could be done either without identity authentication, which means setting up of mobile purses with restricting of payments for certain categories of goods and services (such as alcohol, eroticism, gambling), or with verification of identity, in this case identity authentication forms part of the registration. The customer establishes a new mobile purse by registration – by completion of personal, business or enterprise data and by their confirmation. Registration could be done in several ways. It would be possible to use both the Internet and a mobile phone for registration so free access to unlimited registration would be available almost anytime to anyone.

Registration would be available either for citizens or for entrepreneurs and companies in the form of:

- Self-registration on the Internet (on the operator's website)
- Self-registration using a mobile phone with installed mobile client
- Registration using the client service (Call Centre) of the system operator
- Registration at selected POS locations with enhanced access to the operator's website

4.2 Questionnaire

The idea of the questionnaire was to confirm the hypothesis that if there was a multifunctional, fast and secure mobile payment system, the population would use it for their every day purchases. The technical part of it was done through the website for research called Vyplnto.cz.

The questionnaire was distributed to almost 400 people. It was created in the Czech language. The translated text and questions of the questionnaire are displayed in the supplements. It consisted of fifteen, respectively seventeen, questions connected to volume, place and payment tool of the purchases.

In addition, there were another two questionnaires created, one for fast food chains and the second one was conceived for big petrol station chains in the Czech Republic. Unfortunately, these companies did not cooperate with this market research.

4.2.1 Reality of the Czech market

Despite the increased supply of online payment methods, Czech user preferences remain the same. Cash on delivery absolutely dominate, followed by a bank account money transfer payment. Cash on delivery (Czech Post, DPD, PPL, private delivery, etc.) is used by 70% of the customers based on statistics (according to the Association for Electronic Commerce it is about 80% of the customers).

People consider cash on delivery as the most credible, because they give money from the hand in the exchange for tangible goods. Customers are even willing to pay extra money

for the cash on delivery and thus cover the costs associated with it. The biggest disadvantage for traders in this case is delayed cash flow, as the money for the goods arrives several days after its expedition. Bank account money transfer refers to around 15% of the market share. Its popularity is based on the low prices. Both parties pay only the charges.

Although it is nowadays secure due to the 3-DSecure payment protocol, customers still fear using bank cards on the Internet. Unfortunately, even from the perspective of a trader, it is not the best method. There are high transaction costs, typically from 1.5 to 4%, and there is no money in the account immediately, online is just a confirmation of the transaction.

Due to the above mentioned defects, banks are trying to circumvent them via payment buttons. After clicking on the button an e-shop generates a payment order and redirects the user to the Internet banking. The advantages are obvious. There is the elimination of the card association, which reduces transaction costs below 1%. The disadvantages may be a small extension for the time being, or problems with certificates when logging onto Internet banking. The oldest in the market is a payment button by eBanka, Raiffeisenbank's eKonto is involved in the e-commerce transactions by 1-5%. Another payment button that can be mentioned is Mojebanka.cz by Komerční banka.

An interesting alternative for smaller purchases are micropayments. There is no money used from the bank, but from the so-called electronic purse. The method is suitable for payments in the range of hundreds, so typically for any tickets. The question is whether these systems will survive. History of the Czech Internet has seen several failures.

Mobile phone payments are useful only if a user has fixed costs and a high degree of impulsiveness to purchase. Negatives are clearly again high transaction costs, when the operator charges tens of percent. Another variant is the Premium SMS, but they had a ceiling at 99 CZK till the February 2011 when it was increased up to 600 CZK, and a large percentage of money is received by the operator - typically up to 70%. [46]

4.2.2 Analysis of the results

As the contrast to this information, there are the results from the questionnaire regarding SMP4U. There were finally 118 respondents. The majority of the respondents were aged

between 25 and 34 years (62.7%), respondents aged from 18 to 24 years are represented by 24.6%, 11% are people aged between 35 and 49 and only 1.7 % of respondents were aged 50 or more. It is important to mention that SMP4U is meant to be a useful payment tool for people in the middle age so the majority of respondents of this questionnaire refer to the primary idea of it. The majority lives in the city over 100,000 inhabitants (71.2%), towns from 20,000 to 100,000 inhabitants were represented by 11% and other domicile by 17.8%.

Further important information is that the majority was represented by female (64%), who is connected to the idea of shopping. This could be seen as an advantage due to further positive results.

What are the main advantages and disadvantages you can think about in the cashless payment systems which you use?

Among the main advantages were specified security, no need to have cash in the wallet, easy usage, it is fast and available, people can make distant payments from home, it is a universal, multifunctional and reliable tool. Moreover, there is no need to withdraw money from ATM and also no need to go to the bank. It is possible to use more money than available in the wallet and last but not least that the transaction fees are paid by merchants.

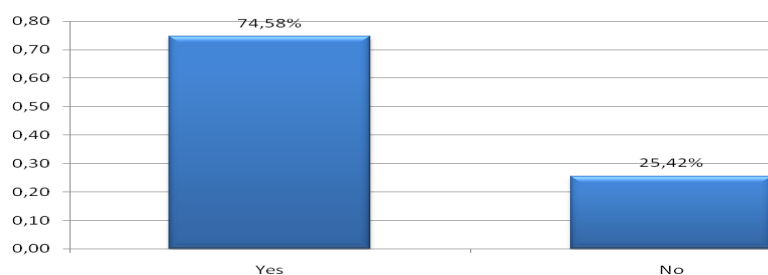
On the other hand, as disadvantages, there were mentioned security (so this is interesting that some perceive it as an advantage while others perceive it as a disadvantage) and in total the possible risk of abuse. High fees for merchants mean they do not want to accept it. Some respondents were concerned about lower control of how much they spend and there was also an opinion of payment before delivery, making it difficult to get money back. The main problem and threat is clear, the majority are thinking about the security, ease to find out the personal data connected with data security when entering PIN, possibility of incorrectly entering bank account number connected with the particular rate of stress if money arrives where intended, long duration of money transfer in case of bank account money transfer, poor overview about the amount paid and not immediate balance of account available, and finally as a whole the risk of abuse mentioned above.

Another crucial reply was regarding the place of payment, that it is not accepted everywhere, the same thing when the terminal does not work, not all international e-shops accept Czech credit cards. A further opinion was that when the client has lost a credit card,

he/she has to wait some time before getting a new one, as well as there are payments for the administration of the accounts. Finally, one respondent thinks that for smaller purchases it is quicker to pay in cash and that these cashless payments make people spend more than they wanted before, which is true when they do not see the immediate balance of the account.

These are the essential questions and answers from the questionnaire. At the beginning of this questionnaire there were the specifications of SMP4U. In the case of the launch in the Czech market, would you be willing to use it?

Graph 1. Willingness to use SMP4U



Resource: Own survey at Vyplnto.cz [9]

If you would not be willing to use it, why?

Respondents concurred that they do not have enough information about the product, then also that they do not trust this new product despite many advantages. There was also mentioned things like it would bring other fees, that it is a toll to support impulsive purchases. The main issue was the fear of abuse in case of theft of the mobile phone. In addition, the opinion is that there already are a lot of payment systems on the market and that up to day that there is no need in using it. Some respondents were not willing to pay for Internet on the mobile phone. Moreover, it was also mentioned that the respondent does not want another party in the payment included except the bank and him/her, but this also stems from insufficient information, because when using SMP4U, it is without the third party. The remaining share of respondents was thinking about the necessity of controlling another account which requires additional operations.

Regarding the average number of daily payments, 115 respondents (97%) make up to five payments daily while the remaining 3% up to ten payments.

4.2.3 Conclusion of the questionnaire survey

To conclude this questionnaire, first it should be mentioned that the main aim was to find out whether people would be willing to use SMP4U or not. That was the set hypothesis. If their answer was yes, then it will be useful to launch it on the market as a new product, but in the case where people would refuse it, then there is no point in launching it.

The most important finding from this survey is that 75% of respondent answered that they would be willing to use SMP4U if launched in the Czech Republic. This is really a very positive result. Maybe when more information is provided to the rest, some of the remaining 25% would change their mind because some respondents replied they would not use it due to a lack of information. This is a more positive result than was primarily expected.

After examining in depth the relation of dependence between the questions (correlation), further results were found. 69 respondents (58%) would be willing to use SMP4U and at the same time have or would acquire Internet in their mobile phones. 14 respondents (12%) would not be willing to use either SMP4U nor to acquire Internet on their mobile phones. There were 16 respondents (14%) who have Internet on their mobile phone, but would not be willing to use it. Maybe with more information and time they could be new potential customers. 19 respondents representing 16% of all the respondents would be willing to use SMP4U, but they do not want to acquire Internet on their mobile phones. Out of this analysis, it is possible to conclude that there is an increase of possible usage SMP4U from 58% up to 88% of respondents. These 88% are only hypothetical because they include those potential customers as mentioned above.

51 respondents (43%) do up to five payments daily as an average at the same time with higher amount than 300 CZK for one payment. 3 respondents (3%) represents the rest, up to ten payments a day in the amount up to 300 CZK for one payment. 64 respondents (54%) refer to five payments a day in the amount up to 300 CZK for one payment. Out of this information arises the fact that the majority executes up to five payments daily in the amount of up to 300 CZK per single payment.

Finally, 36 respondents (31%) would be willing to use it and they do daily in average up to five payments in the amount higher than 300 CZK. 44% (52 respondents) is the same case

except the fact that they pay on average less than 300 CZK per payment. These are the 75% of potential customers to which SMP4U will be focused.

5 Conclusions

A few years after the economic crisis, the Czech Republic has rebounded in 2011 from the bottom, obviously due to the global recovery and also its strong fundamentals. The financial sector is relatively stable and the Czech economy benefits from the recovery of trading partners from the euro areas such as Germany. In contrast, there are many policy challenges which should be considered and solved otherwise the public debt will continue to grow. On the other hand, the recovery is expected to slow down in the near future. This is an important fact, but in the period of the crisis people still needed to pay for their consumption. According to the report of the Česká spořitelna, one of the significant banks in the Czech Republic, its clients conducted 95.9 million transactions by bank card at the merchants totalling 82.4 billion CZK in 2010, which is about 860 CZK on average per a transaction.

However, APEK (Association for Electronic Commerce) confirms that the most popular payment instrument in the Czech Republic is still cash on delivery. It is offered by 97% of e-shops and customers use this form in 70-80% of cases. In the Western world, cash on delivery belongs to the third most favourite payment method (around 12%) and preferred payment method is payment by bank card (80%). Therefore, according to the newest results the popularity of non-cash payments is increasing in the Czech Republic, but it still does not reach the world level. From this information, it is obvious that there is still great potential in this business area.

According to the survey, mobile payment systems are perceived positively among the Czech population and this fact shows that there is space for such systems on the Czech market.

Recently, online payment systems particularly used in e-business and according to its character, did not belong among universal and multifunctional systems, therefore its use

was mostly restricted to determined types of purchases, for example for e-shops, SMS for public transport tickets and so on. For this reason, it is considered that the spreading of these types of systems would not be significant. Nowadays, there isn't a product available that can be used universally for any transaction like the Internet, POS, restaurants, parking, digital TV, local authorities etc. SMP4U could be the solution system which offers such possibilities and in addition is not built on the common e-money carrier (mostly plastic card), but it enters into the device with the high potential of spreading and using – to the mobile phone.

As the part of the business plan, there was also an investment evaluation done to assess whether the project is feasible. Results were interesting for the potential investor. NPV in the last year of the calculations, year 2016, is about 532 million CZK and IRR is in the same year at 80,6 %. Profitability index shows the result of 16,27.

The questionnaire was conducted to find out not only whether it would be useful to launch SMP4U, the multifunctional mobile payment system, on the market as a new product and whether people would be willing to use it. The survey was also done to verify the correction of settings of the business model especially regarding average number of daily payments and its amounts. The survey showed that settings of the model correspond with the reality. 115 respondents (97%) make up to five payments daily and 43% pays more than 300 CZK per transaction.

The results were quite surprising. 75% of respondents answered that they would be willing to use SMP4U if launched in the Czech Republic. Also it is necessary to consider that the real applicable result is 58% of respondents would use SMP4U, because its function is directly connected with the Internet on the mobile phone and the remaining 17% of those who would be willing to use it do not have nor want to acquire Internet on their mobile phones. Despite this fact, the result of 58% is a really significant result.

Examining the payment system market, the core information gained is that it is really fragmented. In the Czech Republic, there still prevails popularity of cash on delivery, but non-cash systems as mentioned above have big potential in the near future. SMP4U offers advantages in the sense of the multifunctional, secure and fast solution with relatively low fees as a mobile payment system. The use of such a system is possible everywhere and

anytime, for example on the Internet, brick and mortar shops, when transferring money, charities (DMS), public transport tickets or entertainment or flight tickets and more. If it gets the possibility to launch, the credit card companies, banks and operators would face a significant competitor in many fields.

Wouldn't it be nice to have such a payment tool representing all the ways of transacting by hand, in the pocket, ready to use every time when needed? That is the important issue for the potential future development of SMP4U and other similar systems.

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7 Supplements

7.1 Survey of the interest in the new product - mobile payment system SMP4U

Special application in the mobile phone allows a user to make and receive payments anywhere, anytime, to anyone just entering the amount and number of mobile purse of the recipient. SMP4U fully preserves the anonymity of the payer. Security is at least at the same level as it is at Internet or GSM banking. To set up this system, there isn't any special investment required, the only condition is to activate the Internet connection on the mobile phone. SMP4U also allows cash withdrawal or transfer of funds between mobile purses of the payer and recipient. The mobile purse account could also be used for the transfer of money from bank accounts or postal money order. Bills together with tickets or vouchers in electronic form are available online on the mobile phone.

SMP4U could be used for instance in the brick and mortar shops , on the Internet, when paying for fuel, taxi fares, tickets for public transport, for flight tickets, parking, etc. SMP4U could replace a personal wallet, current account with bank cards and appropriately complement the Internet banking systems.

SMP4U could represent a safe alternative of income and administration of payments for entrepreneurs and eliminate the risk of handling cash. It allows an instant overview of all payments made and received and the account balance shows money immediately available. The advantages are the low fees the beneficiary pays due to the type of payment from one percent to a maximum amount of five CZK.

The questions were as follows:

Where do you mostly shop? A brick and mortar shop, Internet

What is the preferred form of payment you use when shopping on the Internet? Credit card, PayPal, Cash on delivery, Bank transfer, Other

What are the main advantages and disadvantages you can think about in the cashless payment systems which you use?

At the beginning of this questionnaire was the specification of SMP4U. In the case of the launch at the Czech market, would you be willing to use it? Yes, No – Why?

Which advantages of the SMP4U from the specifications above captured your interest?
Multi-functionality, Speed, Security, Low fees

For SMP4U functioning, it is necessary to have downloaded a special application on your mobile phone. Which installation do you prefer? Personal download from the Internet, record of the application at the set operator

Where would you be willing to use SMP4U? Internet, a brick and mortar shop, other - parking, fast food, petrol stations, cultural events, charity, etc.

Would you also be willing to use SMP4U within your business? If you are not an entrepreneur, this question is meant hypothetically. Yes, No

What is the amount you would be willing to pay monthly for the administration of the software application? Up to 10, 30, 50 CZK

Do you have the Internet on your mobile phone? If not, would you be willing to acquire it for the purpose of SMP4U? I have, No I have not – Yes, I would, No I have not – No, I would not

How many payments do you make daily in average? Up to 5, 10, 20 and more payments

What is the average amount of your payments? Up to 100, 200, 300 and more CZK

Sex: Male / Female

Age: 18 – 24, 25 – 34, 35 – 49, 50 and more

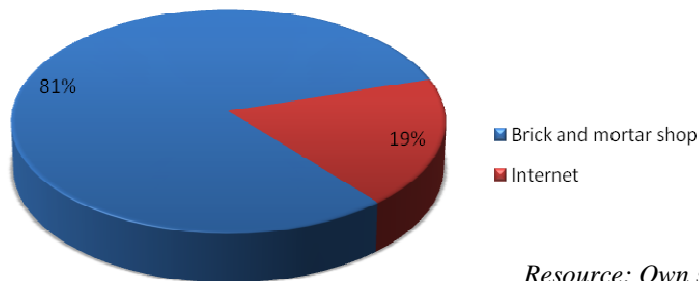
Residence: City over 100,000 inhabitants

Town from 20,000 to 100,000 inhabitants

Other domicile

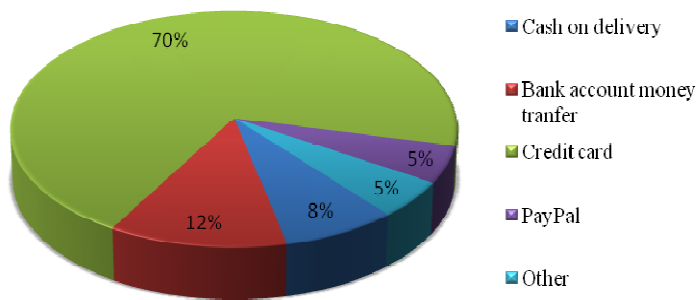
7.2 Results of the questionnaire

Graph 1. Where do you mostly shop?



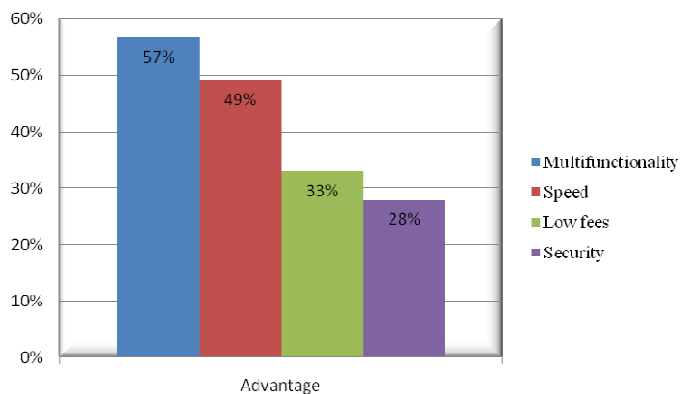
Resource: Own survey at Vyslnto.cz [9]

Graph 2. What is the preferred form of payment you use when shopping on the Internet?



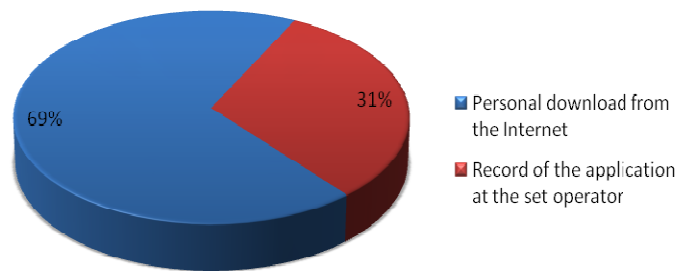
Resource: Own survey at Vyslnto.cz [9]

Graph 3. Which advantages of the SMP4U from the specifications above captured your interest?



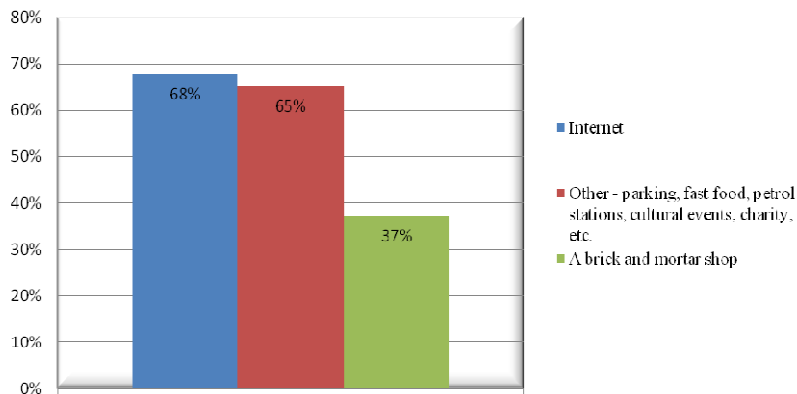
Resource: Own survey at Vyslnto.cz [9]

Graph 4. For SMP4U functioning, it is necessary to have downloaded special application in your mobile phone. Which installation do you prefer?



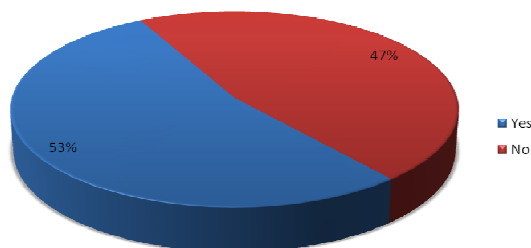
Resource: Own survey at Vyslnto.cz [9]

Graph 5. Where would you be willing to use SMP4U?



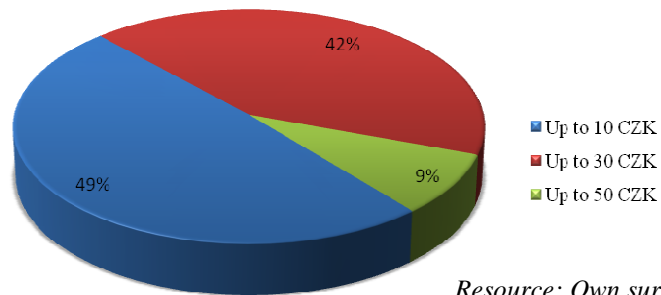
Resource: Own survey at Vyslnto.cz [9]

Graph 6. Would you also be willing to use SMP4U within your business? If you are not an entrepreneur, this question is meant hypothetically.



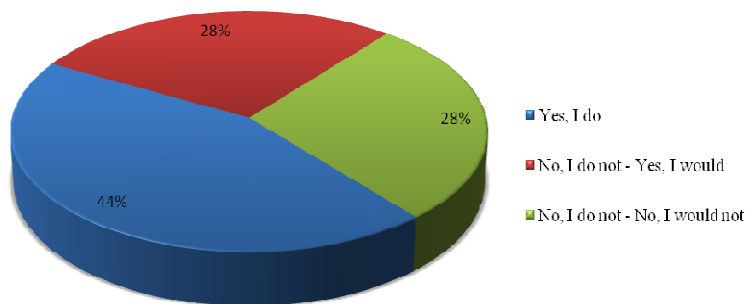
Resource: Own survey at Vyslnto.cz [9]

Graph 7. What is the amount you would be willing to pay monthly for the administration of the software application?



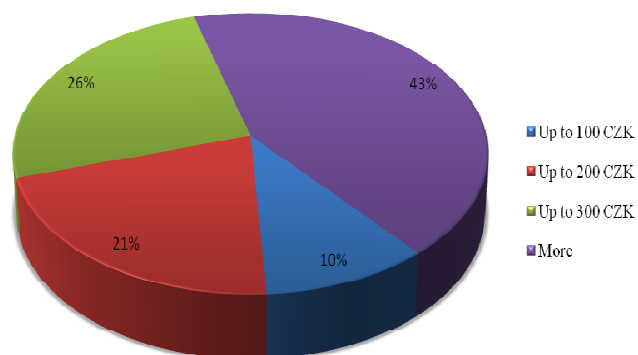
Resource: Own survey at Vyslnto.cz [9]

Graph 8. Do you have the Internet in your mobile phone? If not, would you be willing to acquire it for the purpose of SMP4U?



Resource: Own survey at Vyslnto.cz [9]

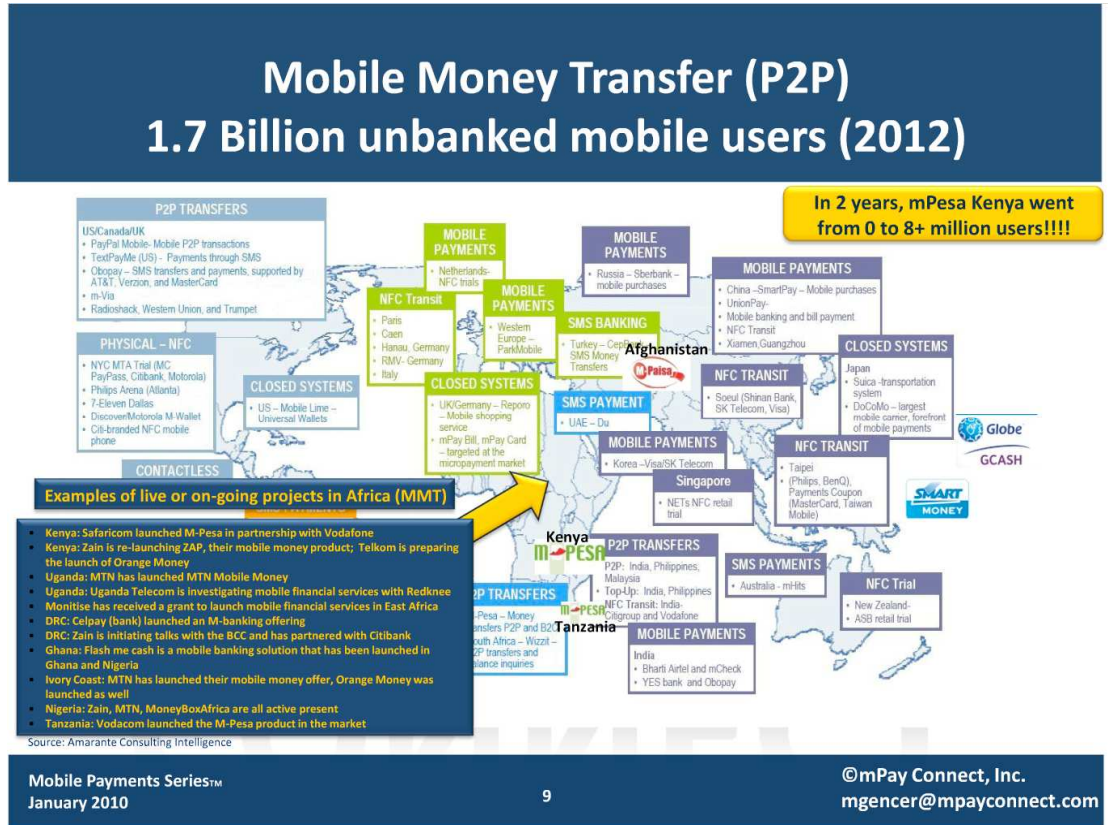
Graph 9. What is the average amount of your payments?



Resource: Own survey at Vyslnto.cz [9]

7.3 Overview of the mobile payment systems in the world

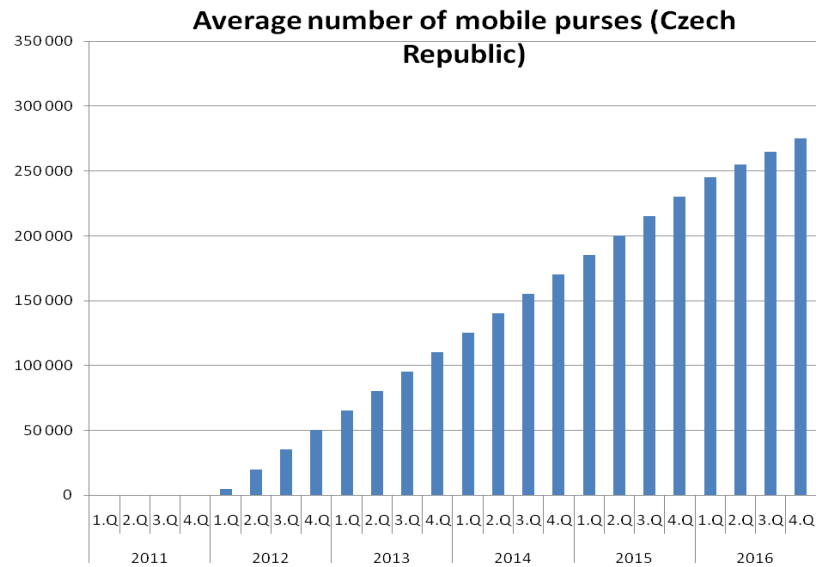
Figure 1. Mobile Payment Systems in the world



Resource: mPay Connect, Inc. [44]

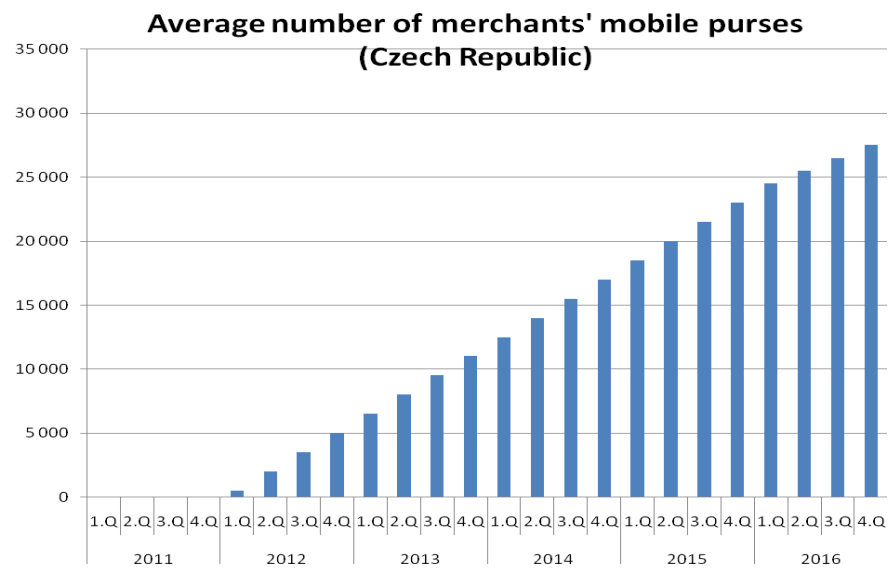
7.4 Estimations of average number of mobile purses in the Czech Republic

Graph 10. Average number of mobile purses in the Czech Republic



Resource: Own calculations

Graph 11. Average number of merchant's mobile purses in the Czech Republic



Resource: Own calculations

7.5 Excel tables from the calculations of the model

Table 1. Trade model

TRADE MODEL (VAT incl.)																				
types of mobile payment operations with e-money in the systém of mobile purses																			services in the system	
	payment			payment with specification									advice		money transfer		cash		admin. fee for apl.	
	Goods	Services	Fuel	Internet	Flight tickets,	Credit recharge	Cash on delivery	public transp. ticket	Tickets	Parking	Meal vouchers	DBTV	Post mon.order	Invoices	within MP	to bank.ac.	Deposit	Withdrawal		
2012	4	4	0,3	2	0,01	0,1	0,1	4	1	4	4	0	0,1	0,1	0,1	3	0,1	0,3	1	TRS/month
	100	100	1000	50	3000	200	500	25	100	40	80	0	500	500	300	3000	500	1000	0	CZK per TRS
	0,00	0,00	5,00	0,00	0,00	0,00	10,00	5,00	5,00	5,00	1,00	0,00	3,00	3,00	0,00	3,00	0,00	0,00	35	CZK from TRS
	1	1	1	1	1	5	0	0	0	0	1	10	0	0	1	0	1	1	0	% per TRS
2013	6	6	0,4	4	0,05	0,2	0,2	6	2	6	6	0	0,3	0,3	0,3	6	0,1	0,4	1	TRS/month
	150	150	1100	60	4000	300	800	25	120	40	80	0	600	1000	500	5000	1000	1500	0	CZK per TRS
	0,00	0,00	5,00	0,00	0,00	0,00	10,00	5,00	5,00	5,00	1,00	0,00	3,00	3,00	0,00	3,00	0,00	0,00	35	CZK from TRS
	1	1	1	1	1	5	0	0	0	0	1	10	0	0	1	0	1	1	0	% per TRS
2014	12	12	0,7	10	0,1	0,3	0,3	10	2	10	8	0,1	0,4	0,4	0,6	10	0,2	0,5	1	TRS/month
	200	200	1100	70	5000	400	1000	25	150	40	80	50	600	1000	600	8000	1000	2000	0	CZK per TRS
	0,00	0,00	5,00	0,00	0,00	0,00	10,00	5,00	5,00	5,00	1,00	0,00	3,00	3,00	0,00	3,00	0,00	0,00	35	CZK from TRS
	1	1	1	1	1	5	0	0	0	0	1	10	0	0	1	0	1	1	0	% per TRS
2015	14	14	0,7	12	0,1	0,3	0,3	12	2	12	8	0,3	0,4	0,4	0,6	12	0,2	0,5	1	TRS/month
	200	200	1200	80	5000	400	1000	25	150	40	80	50	600	1000	600	8000	1000	2000	0	CZK per TRS
	0,00	0,00	0,00	0,00	0,00	0,00	10,00	5,00	5,00	5,00	1,00	0,00	3,00	3,00	0,00	3,00	0,00	0,00	35	CZK from TRS
	1	1	1	1	1	5	0	0	0	0	1	10	0	0	1	0	1	1	0	% per TRS
2016	16	16	0,8	12	0,1	0,2	0,3	12	2	12	8	0,8	0,4	0,4	0,6	12	0,3	0,5	1	TRS/month
	250	250	1200	100	5000	500	1000	25	150	40	80	80	600	1000	600	8000	1500	2000	0	CZK per TRS
	0,00	0,00	0,00	0,00	0,00	0,00	10,00	5,00	5,00	5,00	1,00	0,00	3,00	3,00	0,00	3,00	0,00	0,00	35	CZK from TRS
	1	1	1	1	1	5	0	0	0	0	1	10	0	0	1	0	1	1	0	% per TRS

Resource: Own calculations

Table 2. Revenues

REVENUES																					
	payment			payment with specification									advice		money transfer		cash		admin. fee for apl.	Total per quarter	Total
	Goods	Services	Fuel	Internet	Flight tickets.	Credit recharge	Cash on delivery	Public transp. ticket	Tickets	Parking	Meal vouchers	DBTV	Post mon. order	Invoices	within MP	to bank.ac.	Deposit	Withdrawal			
2012	20 000	20 000	22 500	5 000	1 500	5 000	5 000	100 000	25 000	100 000	36 000	0	3 000	3 000	0	45 000	0	0	175 000	566 000	
	240 000	240 000	270 000	60 000	18 000	60 000	60 000	1 200 000	300 000	1 200 000	432 000	0	36 000	36 000	0	540 000	0	0	2 100 000	6 792 000	
	420 000	420 000	472 500	105 000	31 500	105 000	105 000	2 100 000	525 000	2 100 000	756 000	0	63 000	63 000	0	945 000	0	0	3 675 000	11 886 000	
	600 000	600 000	675 000	150 000	45 000	150 000	150 000	3 000 000	750 000	3 000 000	1 080 000	0	90 000	90 000	0	1 350 000	0	0	5 250 000	16 980 000	36 224 000
2013	1 755 000	1 755 000	1 248 000	468 000	390 000	585 000	390 000	5 850 000	1 950 000	5 850 000	2 106 000	0	351 000	351 000	0	3 510 000	0	0	6 825 000	33 384 000	
	2 160 000	2 160 000	1 536 000	576 000	480 000	720 000	480 000	7 200 000	2 400 000	7 200 000	2 592 000	0	432 000	432 000	0	4 320 000	0	0	8 400 000	41 088 000	
	2 565 000	2 565 000	1 824 000	684 000	570 000	855 000	570 000	8 550 000	2 850 000	8 550 000	3 078 000	0	513 000	513 000	0	5 130 000	0	0	9 975 000	48 792 000	
	2 970 000	2 970 000	2 112 000	792 000	660 000	990 000	660 000	9 900 000	3 300 000	9 900 000	3 564 000	0	594 000	594 000	0	5 940 000	0	0	11 550 000	56 496 000	179 760 000
2014	9 000 000	9 000 000	4 200 000	2 625 000	1 875 000	2 250 000	1 125 000	18 750 000	3 750 000	18 750 000	5 400 000	187 500	900 000	900 000	0	11 250 000	0	0	13 125 000	103 087 500	
	10 080 000	10 080 000	4 704 000	2 940 000	2 100 000	2 520 000	1 260 000	21 000 000	4 200 000	21 000 000	6 048 000	210 000	1 008 000	1 008 000	0	12 600 000	0	0	14 700 000	115 458 000	
	11 160 000	11 160 000	5 208 000	3 255 000	2 325 000	2 790 000	1 395 000	23 250 000	4 650 000	23 250 000	6 696 000	232 500	1 116 000	1 116 000	0	13 950 000	0	0	16 275 000	127 828 500	
	12 240 000	12 240 000	5 712 000	3 570 000	2 550 000	3 060 000	1 530 000	25 500 000	5 100 000	25 500 000	7 344 000	255 000	1 224 000	1 224 000	0	15 300 000	0	0	17 850 000	140 199 000	486 573 000
2015	15 540 000	15 540 000	4 662 000	5 328 000	2 775 000	3 330 000	1 665 000	33 300 000	5 550 000	33 300 000	7 992 000	832 500	1 332 000	1 332 000	0	19 980 000	0	0	19 425 000	171 883 500	
	16 800 000	16 800 000	5 040 000	5 760 000	3 000 000	3 600 000	1 800 000	36 000 000	6 000 000	36 000 000	8 640 000	900 000	1 440 000	1 440 000	0	21 600 000	0	0	21 000 000	185 820 000	
	18 060 000	18 060 000	5 418 000	6 192 000	3 225 000	3 870 000	1 935 000	38 700 000	6 450 000	38 700 000	9 288 000	967 500	1 548 000	1 548 000	0	23 220 000	0	0	22 575 000	199 756 500	
	19 320 000	19 320 000	5 796 000	6 624 000	3 450 000	4 140 000	2 070 000	41 400 000	6 900 000	41 400 000	9 936 000	1 035 000	1 656 000	1 656 000	0	24 840 000	0	0	24 150 000	213 693 000	771 153 000
2016	29 400 000	29 400 000	7 056 000	8 820 000	3 675 000	3 675 000	2 205 000	44 100 000	7 350 000	44 100 000	10 584 000	4 704 000	1 764 000	1 764 000	0	26 460 000	0	0	25 725 000	250 782 000	
	30 600 000	30 600 000	7 344 000	9 180 000	3 825 000	3 825 000	2 295 000	45 900 000	7 650 000	45 900 000	11 016 000	4 896 000	1 836 000	1 836 000	0	27 540 000	0	0	26 775 000	261 018 000	
	31 800 000	31 800 000	7 632 000	9 540 000	3 975 000	3 975 000	2 385 000	47 700 000	7 950 000	47 700 000	11 448 000	5 088 000	1 908 000	1 908 000	0	28 620 000	0	0	27 825 000	271 254 000	
	33 000 000	33 000 000	7 920 000	9 900 000	4 125 000	4 125 000	2 475 000	49 500 000	8 250 000	49 500 000	11 880 000	5 280 000	1 980 000	1 980 000	0	29 700 000	0	0	28 875 000	281 490 000	1 064 544 000

Resource: Own calculations

Table 3. Tariff rates of advertisement

TARIFF RATES OF ADVERTISEMENT SALES, MARKETING INFORMATION AND ADMIN. OF LOYALTY PROGRAMMES																			
	ads (information) / questionnaire (to 480 symbols, graphics)							marketing information from operating monthly (sales revenues in CZK per year)						admin. of loyalty programmes per month (sales revenues in CZK per year)					
	200MP	1000MP	10ths.MP	100ths.MP	500ths.MP	1mil.MP	>1mil.MP	to 3mil.	to 12mil.	to 60mil.	to 120mil.	to 600mil.	>600mil.	to 3mil.	to 12mil.	to 60mil.	to 120mil.	to 600mil.	>600mil.
price	50	250	2 500	25 000	50 000	80 000	100 000	500	2 000	10 000	20 000	60 000	200 000	500	2 000	10 000	20 000	60 000	200 000
CZK	75	375	3 750	37 500	75 000	120 000	150 000	-	-	-	-	-	-	-	-	-	-	-	-
2012	15	5	1	0	0	0	0	15	5	1	0	0	0	0	0	0	0	0	0
	60	20	2	0	0	0	0	60	20	2	0	0	0	0	0	0	0	0	0
	105	35	4	0	0	0	0	105	35	4	0	0	0	0	0	0	0	0	0
	150	50	5	0	0	0	0	150	50	5	0	0	0	0	0	0	0	0	0
2013	260	195	20	7	0	0	0	260	195	20	7	0	0	20	7	0	0	0	0
	320	240	24	8	0	0	0	320	240	24	8	0	0	24	8	0	0	0	0
	380	285	29	10	0	0	0	380	285	29	10	0	0	29	10	0	0	0	0
	440	330	33	11	0	0	0	440	330	33	11	0	0	33	11	0	0	0	0
2014	625	375	63	25	13	3	0	625	375	63	25	13	0	63	25	13	0	0	0
	700	420	70	28	14	3	0	700	420	70	28	14	0	70	28	14	0	0	0
	775	465	78	31	16	3	0	775	465	78	31	16	0	78	31	16	0	0	0
	850	510	85	34	17	3	0	850	510	85	34	17	0	85	34	17	0	0	0
2015	925	555	93	37	19	4	2	925	555	93	37	19	2	93	37	19	2	0	0
	1 000	600	100	40	20	4	2	1 000	600	100	40	20	2	100	40	20	2	0	0
	1 075	645	108	43	22	4	2	1 075	645	108	43	22	2	108	43	22	2	0	0
	1 150	690	115	46	23	5	2	1 150	690	115	46	23	2	115	46	23	2	0	0
2016	1 225	735	123	49	25	5	2	1 225	735	123	49	25	2	123	49	25	2	0	0
	1 275	765	128	51	26	5	3	1 275	765	128	51	26	3	128	51	26	3	0	0
	1 325	795	133	53	27	5	3	1 325	795	133	53	27	3	133	53	27	3	0	0
	1 375	825	138	55	28	6	3	1 375	825	138	55	28	3	138	55	28	3	0	0

Resource: Own calculations

Table 4. Revenues from advertisement, marketing information and admin. of loyalty programmes

REVENUES FROM ADVERTISEMENT, MARKETING INFORMATION AND ADMIN. OF LOYALTY PROGRAMMES																					
	ads (information) / questionnaire (to 480 symbols, graphics)							marketing information from operating monthly (sales revenues in CZK per year)						admin. of loyalty programmes per month (sales revenues in CZK per year)						Total per Q	Total
	200MP	1000MP	10ths.MP	100ths.MP	500ths.MP	1mil.MP	>1mil.MP	to 3mil.	to 12mil.	to 60mil.	to 120mil.	to 600mil.	>600mil.	to 3mil.	to 12mil.	to 60mil.	to 120mil.	to 600mil.	>600mil.		
price	50	250	2 500	25 000	50 000	80 000	100 000	500	2 000	10 000	20 000	60 000	200 000	500	2 000	10 000	20 000	60 000	200 000		
CZK	75	375	3 750	37 500	75 000	120 000	150 000	-	-	-	-	-	-	-	-	-	-	-	-		
2012	938	1 563	1 563	0	0	0	0	7 500	10 000	5 000	0	0	0	0	0	0	0	0	0	26 563	
	3 750	6 250	6 250	0	0	0	0	30 000	40 000	20 000	0	0	0	0	0	0	0	0	0	106 250	
	6 563	10 938	10 938	0	0	0	0	52 500	70 000	35 000	0	0	0	0	0	0	0	0	0	185 938	
	9 375	15 625	15 625	0	0	0	0	75 000	100 000	50 000	0	0	0	0	0	0	0	0	0	265 625	584 375
2013	16 250	60 938	60 938	203 125	0	0	0	130 000	390 000	195 000	130 000	0	0	9 750	13 000	0	0	0	0	1 209 000	
	20 000	75 000	75 000	250 000	0	0	0	160 000	480 000	240 000	160 000	0	0	12 000	16 000	0	0	0	0	1 488 000	
	23 750	89 063	89 063	296 875	0	0	0	190 000	570 000	285 000	190 000	0	0	14 250	19 000	0	0	0	0	1 767 000	
	27 500	103 125	103 125	343 750	0	0	0	220 000	660 000	330 000	220 000	0	0	16 500	22 000	0	0	0	0	2 046 000	6 510 000
2014	39 063	117 188	195 313	781 250	781 250	250 000	0	312 500	750 000	625 000	500 000	750 000	0	31 250	50 000	125 000	0	0	0	5 307 813	
	43 750	131 250	218 750	875 000	875 000	280 000	0	350 000	840 000	700 000	560 000	840 000	0	35 000	56 000	140 000	0	0	0	5 944 750	
	48 438	145 313	242 188	968 750	968 750	310 000	0	387 500	930 000	775 000	620 000	930 000	0	38 750	62 000	155 000	0	0	0	6 581 688	
	53 125	159 375	265 625	1 062 500	1 062 500	340 000	0	425 000	1 020 000	850 000	680 000	1 020 000	0	42 500	68 000	170 000	0	0	0	7 218 625	25 052 875
2015	57 813	173 438	289 063	1 156 250	1 156 250	370 000	231 250	462 500	1 110 000	925 000	740 000	1 110 000	370 000	46 250	74 000	185 000	37 000	0	0	8 493 813	
	62 500	187 500	312 500	1 250 000	1 250 000	400 000	250 000	500 000	1 200 000	1 000 000	800 000	1 200 000	400 000	50 000	80 000	200 000	40 000	0	0	9 182 500	
	67 188	201 563	335 938	1 343 750	1 343 750	430 000	268 750	537 500	1 290 000	1 075 000	860 000	1 290 000	430 000	53 750	86 000	215 000	43 000	0	0	9 871 188	
	71 875	215 625	359 375	1 437 500	1 437 500	460 000	287 500	575 000	1 380 000	1 150 000	920 000	1 380 000	460 000	57 500	92 000	230 000	46 000	0	0	10 559 875	38 107 375
2016	76 563	229 688	382 813	1 531 250	1 531 250	490 000	306 250	612 500	1 470 000	1 225 000	980 000	1 470 000	490 000	61 250	98 000	245 000	49 000	0	0	11 248 563	
	79 688	239 063	398 438	1 593 750	1 593 750	510 000	318 750	637 500	1 530 000	1 275 000	1 020 000	1 530 000	510 000	63 750	102 000	255 000	51 000	0	0	11 707 688	
	82 813	248 438	414 063	1 656 250	1 656 250	530 000	331 250	662 500	1 590 000	1 325 000	1 060 000	1 590 000	530 000	66 250	106 000	265 000	53 000	0	0	12 166 813	
	85 938	257 813	429 688	1 718 750	1 718 750	550 000	343 750	687 500	1 650 000	1 375 000	1 100 000	1 650 000	550 000	68 750	110 000	275 000	55 000	0	0	12 625 938	47 749 000

Resource: Own calculations

Table 5. Estimation of partial investment costs

ESTIMATION OF PARTIAL INVESTMENT COSTS														
	price of office	price of PC	outsourcing	no. of	acquir.of dB	costs for	fix.pay.tariff	no.of md	invest.costs	Q.(5,5%)	sw licence	other sw	cost per sw	exch.rate
	reconstr.	network	per month	employees		SW acq.	per md		per settings of	fees for dB	price per	licence	(depreciated)	CZK/EUR
									SW applic.	maintanance	empl.	price		
2012	0	0	10 000	9	5 060 000	1 200 000	10 000	42	420 000	344 300	13 000	500 000	617 000	25
	500 000	500 000	10 000	10	0	0	10 000	63	630 000	344 300	13 000	0	13 000	25
	0	0	15 000	13	0	0	10 000	0	0	344 300	13 000	0	39 000	25
	0	0	20 000	21	0	0	10 000	63	630 000	344 300	13 000	0	104 000	25
	500 000	500 000			5 060 000	1 200 000			1 680 000	1 377 200			773 000	
2013	1 000 000	1 000 000	20 000	32	10 120 000	1 200 000	10 000	126	1 260 000	966 900	14 000	1 500 000	1 654 000	25
	0	0	20 000	32	0	0	10 000	126	1 260 000	966 900	14 000	0	0	25
	0	0	25 000	41	0	0	10 000	0	0	966 900	14 000	0	126 000	25
	0	0	25 000	41	0	0	10 000	63	630 000	966 900	14 000	0	0	25
	1 000 000	1 000 000			10 120 000	1 200 000			3 150 000	3 867 600			1 780 000	
2014	1 000 000	2 000 000	30 000	51	15 180 000	2 400 000	12 000	189	2 268 000	1 933 800	14 000	2 000 000	2 140 000	25
	0	0	30 000	51	0	0	12 000	189	2 268 000	1 933 800	14 000	0	0	25
	0	0	35 000	60	0	0	12 000	0	0	1 933 800	14 000	0	126 000	25
	0	0	35 000	60	0	0	12 000	126	1 512 000	1 933 800	14 000	0	0	25
	1 000 000	2 000 000			15 180 000	2 400 000			6 048 000	7 735 200			2 266 000	
2015	1 000 000	2 000 000	40 000	73	20 240 000	2 400 000	12 000	126	1 512 000	3 179 000	15 000	2 500 000	2 695 000	25
	0	0	40 000	73	0	0	12 000	126	1 512 000	3 179 000	15 000	0	0	25
	0	0	45 000	82	0	0	12 000	0	0	3 179 000	15 000	0	135 000	25
	0	0	45 000	82	0	0	12 000	63	756 000	3 179 000	15 000	0	0	25
	1 000 000	2 000 000			20 240 000	2 400 000			3 780 000	12 716 000			2 830 000	
2016	1 000 000	2 000 000	50 000	89	25 300 000	4 800 000	13 000	189	2 457 000	4 834 500	15 000	3 000 000	3 105 000	25
	0	0	50 000	89	0	0	13 000	189	2 457 000	4 834 500	15 000	0	0	25
	0	0	50 000	94	0	0	13 000	0	0	4 834 500	15 000	0	75 000	25
	0	0	50 000	94	0	0	13 000	126	1 638 000	4 834 500	15 000	0	0	25
	1 000 000	2 000 000			25 300 000	4 800 000			6 552 000	19 338 000			3 180 000	

Resource: Own calculations

Table 6. Operating costs

OPERATING COSTS														
year	PERSONNEL EXPENSES	OUTSO. + OFFICE RENT	UTILITY COSTS	OFFICE TECH.RENT +FURN.PUR	ADMIN. COSTS	COSTS FOR PR+ PROMO	OVERHEAD COSTS	RENT OF COMM.EXTE NS.	OP.LEAS. HW + FEES	COSTS TAX INEFFECT.	COST RESERVE	FEES FOR PATENT USE	Costs per Q	Costs per year
2012	1 206 000	496 800	75 600	216 000	300 000	2 500 000	1 418 700	120 000	900 000	20 000	0	9 876	7 262 976	
	1 306 500	526 800	75 600	1 080 000	300 000	1 000 000	230 500	180 000	1 210 000	20 000	0	114 971	6 044 371	
	1 688 400	811 800	75 600	312 000	300 000	1 000 000	353 200	240 000	1 200 000	30 000	0	201 199	6 212 199	
	2 653 200	1 486 800	100 800	504 000	200 000	2 000 000	477 000	300 000	1 620 000	30 000	552 476	287 427	10 211 703	
	6 854 100	3 322 200	327 600	2 112 000	1 100 000	6 500 000	2 479 400	840 000	4 930 000	100 000	552 476	613 473	0	29 731 249
2013	7 477 200	2 354 805	172 200	2 368 000	500 000	10 000 000	3 343 500	300 000	3 660 000	80 000	0	1 162 790	31 418 495	
	7 477 200	2 354 805	215 250	768 000	500 000	5 000 000	921 900	300 000	3 030 000	80 000	0	1 431 126	22 078 281	
	9 426 900	3 509 805	215 250	984 000	1 000 000	2 000 000	1 067 700	300 000	2 400 000	80 000	0	1 699 462	22 683 117	
	9 426 900	3 509 805	258 300	984 000	1 000 000	3 000 000	1 067 700	300 000	3 030 000	80 000	1 884 464	1 967 798	26 508 968	
	33 808 200	11 729 220	861 000	5 104 000	3 000 000	20 000 000	6 400 800	1 200 000	12 120 000	320 000	1 884 464	6 261 176	0	102 688 861
2014	13 728 300	5 226 300	378 000	2 897 000	1 000 000	10 000 000	5 704 300	300 000	5 112 000	100 000	0	5 465 310	49 911 210	
	13 728 300	5 226 300	441 000	1 377 000	1 000 000	10 000 000	1 664 700	300 000	5 112 000	100 000	0	6 121 147	45 070 447	
	15 858 900	6 936 300	441 000	1 620 000	1 000 000	5 000 000	1 819 500	300 000	3 600 000	100 000	0	6 776 984	43 452 684	
	15 858 900	6 936 300	504 000	1 620 000	1 000 000	5 000 000	1 819 500	300 000	4 356 000	100 000	3 143 312	7 432 821	48 070 833	
	59 174 400	24 325 200	1 764 000	7 514 000	4 000 000	30 000 000	11 008 000	1 200 000	18 180 000	400 000	3 143 312	25 796 263	0	186 505 175
2015	21 909 000	9 629 610	688 800	3 951 000	1 000 000	10 000 000	10 365 700	450 000	7 224 000	150 000	0	12 126 206	77 494 316	
	21 909 000	9 629 610	688 800	1 971 000	1 000 000	10 000 000	2 312 900	450 000	5 712 000	150 000	0	13 109 412	66 932 722	
	24 421 500	11 939 610	688 800	2 214 000	1 500 000	10 000 000	2 468 600	450 000	4 200 000	150 000	0	14 092 618	72 125 128	
	24 421 500	11 939 610	688 800	2 214 000	1 500 000	10 000 000	2 468 600	450 000	4 956 000	150 000	4 708 249	15 075 824	78 572 582	
	92 661 000	43 138 440	2 755 200	10 350 000	5 000 000	40 000 000	17 615 800	1 800 000	22 092 000	600 000	4 708 249	54 404 059	0	295 124 748
2016	27 918 900	14 346 870	987 000	3 483 000	1 500 000	10 000 000	14 820 500	450 000	6 438 000	150 000	0	17 615 500	97 709 770	
	27 918 900	14 346 870	987 000	2 403 000	1 500 000	10 000 000	2 767 700	450 000	5 619 000	150 000	0	18 334 500	84 476 970	
	29 325 900	15 096 870	987 000	2 538 000	2 000 000	10 000 000	2 864 200	450 000	4 800 000	150 000	0	19 053 500	87 265 470	
	29 325 900	15 096 870	987 000	2 538 000	2 000 000	10 000 000	2 864 200	450 000	5 619 000	150 000	5 657 594	19 772 500	94 461 064	
	114 489 600	58 887 480	3 948 000	10 962 000	7 000 000	40 000 000	23 316 600	1 800 000	22 476 000	600 000	5 657 594	74 776 000	0	363 913 274

Resource: Own calculations

Table 7. Partial operating costs

PARTIAL OPERATING COSTS - RECRUITMENT, INTERESTS															
year	top manag. and specialists entry	number of top manag. and	average salary spec.+top/month	mid.man. and spec. entry	number of mid.man. and spec.	average salary spec.	ref.empl.entry	no. of ref.empl.	avr.sal.of ref.	avr.sal. CC empl.	avr. salary per company	total number except CC	total no.of employees	Q. patent fees % sales rev.	interest issued
2012	1	1	60 000	2	2	45 000	6	6	25 000	21 000	33 333	9	9	2	0
	0	1	60 000	0	2	45 000	1	7	25 000	21 000	32 500	10	10	2	0
	0	1	60 000	1	3	45 000	2	9	25 000	23 000	32 308	13	13	2	0
	0	1	60 000	2	5	45 000	6	15	25 000	23 000	31 429	21	21	2	0
													5 115 000		0
2013	2	3	150 000	5	10	65 000	4	19	40 000	24 000	58 125	32	32	4	0
	0	3	150 000	0	10	65 000	0	19	40 000	24 000	58 125	32	32	4	0
	0	3	150 000	5	15	65 000	4	23	40 000	24 000	57 195	41	41	4	0
	0	3	150 000	0	15	65 000	0	23	40 000	24 000	57 195	41	41	4	0
													25 230 000		0
2014	1	4	200 000	5	20	70 000	4	27	45 000	25 000	66 961	51	51	6	0
	0	4	200 000	0	20	70 000	0	27	45 000	25 000	66 961	51	51	6	0
	0	4	200 000	5	25	70 000	4	31	45 000	25 000	65 750	60	60	6	0
	0	4	200 000	0	25	70 000	0	31	45 000	25 000	65 750	60	60	6	0
													44 160 000		0
2015	1	5	250 000	7	32	75 000	5	36	50 000	25 000	74 658	73	73	8	0
	0	5	250 000	0	32	75 000	0	36	50 000	25 000	74 658	73	73	8	0
	0	5	250 000	7	39	75 000	2	38	50 000	25 000	74 085	82	82	8	0
	0	5	250 000	0	39	75 000	0	38	50 000	25 000	74 085	82	82	8	0
													69 150 000		0
2016	0	5	250 000	4	43	80 000	3	41	55 000	25 000	78 034	89	89	8	0
	0	5	250 000	0	43	80 000	0	41	55 000	25 000	78 034	89	89	8	0
	0	5	250 000	3	46	80 000	2	43	55 000	25 000	77 606	94	94	8	0
	0	5	250 000	0	46	80 000	0	43	55 000	25 000	77 606	94	94	8	0
													85 440 000		0
total	5			46			43					94	94		

Resource: Own calculations

Table 8. Partial operating costs

PARTIAL OPERATING COSTS - OFFICE RENT + EQUIPMENT, UTILITY, PROMOTION, OFFICE TECHN., HW AND COMMUNICATION - RENT, SW																		
year	area office per oth.empl.	total office area	total area of office	rent in EUR/ metre	service fee/metre CZK	rent/month + service/metre	office tech.per month per empl.	purchase of office equip.to 40 ths.per empl.	no.od empl.for furniture	Q price of furniture	Q rent of HW	rent of comm.ext./month	Q legal, admin, consult.	utility costs metre and month	Q promo costs	fix.paym. tariff for md	no.of md	op.costs SMP4U+ER P
2012	0	168	168	12	150	450	8 000	0	0	0	900 000	40 000	300 000	150	2 500 000	10 000	0	0
	0	168	168	12	150	450	8 000	40 000	21	840 000	1 000 000	60 000	300 000	150	1 000 000	10 000	21	210 000
	0	168	168	12	150	450	8 000	0	0	0	1 200 000	80 000	300 000	150	1 000 000	10 000	0	0
	8	168	168	12	150	450	8 000	0	0	0	1 200 000	100 000	200 000	200	2 000 000	10 000	42	420 000
						907 200					840 000	4 300 000		1 100 000		6 500 000		
2013	0	287	287	13	180	505	8 000	80 000	20	1 600 000	2 400 000	100 000	500 000	200	10 000 000	10 000	126	1 260 000
	0	287	287	13	180	505	8 000	0		0	2 400 000	100 000	500 000	250	5 000 000	10 000	63	630 000
	0	287	287	13	180	505	8 000	0		0	2 400 000	100 000	1 000 000	250	2 000 000	10 000	0	0
	7	287	287	13	180	505	8 000	0	0	0	2 400 000	100 000	1 000 000	300	3 000 000	10 000	63	630 000
						1 739 220					1 600 000	9 600 000		3 000 000		20 000 000		
2014	0	420	420	13	180	505	9 000	80 000	19	1 520 000	3 600 000	100 000	1 000 000	300	10 000 000	12 000	126	1 512 000
	0	420	420	13	180	505	9 000	0	0	0	3 600 000	100 000	1 000 000	350	10 000 000	12 000	126	1 512 000
	0	420	420	13	180	505	9 000	0		0	3 600 000	100 000	1 000 000	350	5 000 000	12 000	0	0
	7	420	420	13	180	505	9 000	0		0	3 600 000	100 000	1 000 000	400	5 000 000	12 000	63	756 000
						2 545 200					1 520 000	14 400 000		4 000 000		30 000 000		
2015	0	574	574	13	180	505	9 000	90 000	22	1 980 000	4 200 000	150 000	1 000 000	400	10 000 000	12 000	252	3 024 000
	0	574	574	13	180	505	9 000	0	0	0	4 200 000	150 000	1 000 000	400	10 000 000	12 000	126	1 512 000
	0	574	574	13	180	505	9 000	0		0	4 200 000	150 000	1 500 000	400	10 000 000	12 000	0	0
	7	574	574	13	180	505	9 000	0	0	0	4 200 000	150 000	1 500 000	400	10 000 000	12 000	63	756 000
						3 478 440					1 980 000	16 800 000		5 000 000		40 000 000		
2016	0	658	658	13	180	505	9 000	90 000	12	1 080 000	4 800 000	150 000	1 500 000	500	10 000 000	13 000	126	1 638 000
	0	658	658	13	180	505	9 000	0	0	0	4 800 000	150 000	1 500 000	500	10 000 000	13 000	63	819 000
	0	658	658	13	180	505	9 000	0		0	4 800 000	150 000	2 000 000	500	10 000 000	13 000	0	0
	7	658	658	13	180	505	9 000	0		0	4 800 000	150 000	2 000 000	500	10 000 000	13 000	63	819 000
						3 987 480					1 080 000	19 200 000		7 000 000		40 000 000		

Resource: Own calculations

Table 9. Partial operating costs

PARTIAL OPERATING COSTS - OVERHEAD COSTS, CARS - RENT AND OPERATING, INSURANCE, TAX INEFFECTIVE, RESERVE																
year	travel costs/em pl/Q	Q office equip. per empl.	insurance of comp.and property	post+tel.fe es per empl. Q	Q overhead per company	acquir. of top cl.cars	acquir. of mid.cl.cars	no of.top class cars	no.of mid.class cars	fix.pay.tariff top class cars	fix.pay.tariff per month/mid. car	avr.month op. leas.per car	fuel, cleaning cars/month	Q overhead cars	% of costs reserve	costs tax ineffect.
2012	2 000	1 000	1 200 000	12 000	1 348 200	0	1	0	1	35 000	18 000	18 000	5 500	70 500		20 000
	2 000	1 000	0	12 000	160 000	0	0	0	1	35 000	18 000	18 000	5 500	70 500		20 000
	2 000	1 000	0	12 000	212 200	0	1	0	2	35 000	18 000	18 000	5 500	141 000		30 000
	2 000	1 000	0	12 000	336 000	0	0	0	2	35 000	18 000	18 000	5 500	141 000		30 000
			1 200 000		2 056 400									423 000	2	100 000
2013	2 000	1 000	2 400 000	12 000	2 940 000	1	2	1	4	35 000	18 000	21 400	5 500	403 500		80 000
	2 000	1 000	0	12 000	518 400	0	0	1	4	35 000	18 000	21 400	5 500	403 500		80 000
	2 000	1 000	0	12 000	664 200	0	0	1	4	35 000	18 000	21 400	5 500	403 500		80 000
	2 000	1 000	0	12 000	664 200	0	0	1	4	35 000	18 000	21 400	5 500	403 500		80 000
			2 400 000		4 786 800									1 614 000	2	320 000
2014	3 000	1 000	4 000 000	12 000	4 916 800	2	2	3	6	35 000	18 000	23 667	5 500	787 500		100 000
	3 000	1 000	0	12 000	877 200	0	0	3	6	35 000	18 000	23 667	5 500	787 500		100 000
	3 000	1 000	0	12 000	1 032 000	0	0	3	6	35 000	18 000	23 667	5 500	787 500		100 000
	3 000	1 000	0	12 000	1 032 000	0	0	3	6	35 000	18 000	23 667	5 500	787 500		100 000
			4 000 000		7 858 000									3 150 000	2	400 000
2015	3 000	1 000	8 000 000	12 000	9 315 700	1	2	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
	3 000	1 000	0	12 000	1 262 900	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
	3 000	1 000	0	12 000	1 418 600	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
	3 000	1 000	0	12 000	1 418 600	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
			8 000 000		13 415 800									4 200 000	2	600 000
2016	4 000	1 000	12 000 000	13 000	13 770 500	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
	4 000	1 000	0	13 000	1 717 700	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
	4 000	1 000	0	13 000	1 814 200	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
	4 000	1 000	0	13 000	1 814 200	0	0	4	8	35 000	18 000	23 667	5 500	1 050 000		150 000
			12 000 000		19 116 600									4 200 000	2	600 000

Resource: Own calculations

Table 10. Partial operating costs

	Office reconstruction	Acquir.of data network 40Mb	Acquir.of office SW licences	Acq.. Adjustment and setting of applic.+ ERP+ dB	Costs per quarter	Costs per year
2012	0	0	617 000	7 024 300	7 641 300	
	500 000	500 000	13 000	974 300	1 987 300	
	0	0	39 000	344 300	383 300	
	0	0	104 000	974 300	1 078 300	
	500 000	500 000	773 000	9 317 200	0	11 090 200
2013	1 000 000	1 000 000	1 654 000	13 546 900	17 200 900	
	0	0	0	2 226 900	2 226 900	
	0	0	126 000	966 900	1 092 900	
	0	0	0	1 596 900	1 596 900	
	1 000 000	1 000 000	1 780 000	18 337 600	0	22 117 600
2014	1 000 000	2 000 000	2 140 000	21 781 800	26 921 800	
	0	0	0	4 201 800	4 201 800	
	0	0	126 000	1 933 800	2 059 800	
	0	0	0	3 445 800	3 445 800	
	1 000 000	2 000 000	2 266 000	31 363 200	0	36 629 200
2015	1 000 000	2 000 000	2 695 000	27 331 000	33 026 000	
	0	0	0	4 691 000	4 691 000	
	0	0	135 000	3 179 000	3 314 000	
	0	0	0	3 935 000	3 935 000	
	1 000 000	2 000 000	2 830 000	39 136 000	0	44 966 000
2016	1 000 000	2 000 000	3 105 000	37 391 500	43 496 500	
	0	0	0	7 291 500	7 291 500	
	0	0	75 000	4 834 500	4 909 500	
	0	0	0	6 472 500	6 472 500	
	1 000 000	2 000 000	3 180 000	55 990 000	0	62 170 000

Resource: Own calculations

Table 11. Depreciation

	purchase price	2012	2013	2014	2015	2016	Total
2012	7 641 300	0	0	0	0	0	
	1 987 300	0	0	0	0	0	
	383 300	0	0	0	0	0	
	1 078 300	0	0	0	0	0	
	11 090 200	2 218 040	0	0	0	0	2 218 040
2013	17 200 900	0	0	0	0	0	
	2 226 900	0	0	0	0	0	
	1 092 900	0	0	0	0	0	
	1 596 900	0	0	0	0	0	
	22 117 600	4 436 080	4 423 520	0	0	0	8 859 600
2014	26 921 800	0	0	0	0	0	
	4 201 800	0	0	0	0	0	
	2 059 800	0	0	0	0	0	
	3 445 800	0	0	0	0	0	
	36 629 200	4 436 080	8 847 040	7 325 840	0	0	20 608 960
2015	33 026 000	0	0	0	0	0	
	4 691 000	0	0	0	0	0	
	3 314 000	0	0	0	0	0	
	3 935 000	0	0	0	0	0	
	44 966 000	0	8 847 040	14 651 680	8 993 200	0	32 491 920
2016	43 496 500	0	0	0	0	0	
	7 291 500	0	0	0	0	0	
	4 909 500	0	0	0	0	0	
	6 472 500	0	0	0	0	0	
	62 170 000	0	0	14 651 680	17 986 400	12 434 000	45 072 080

straight-line depreciation	1. year	2. year	3. year
	20%	40%	40%

Resource: Own calculations

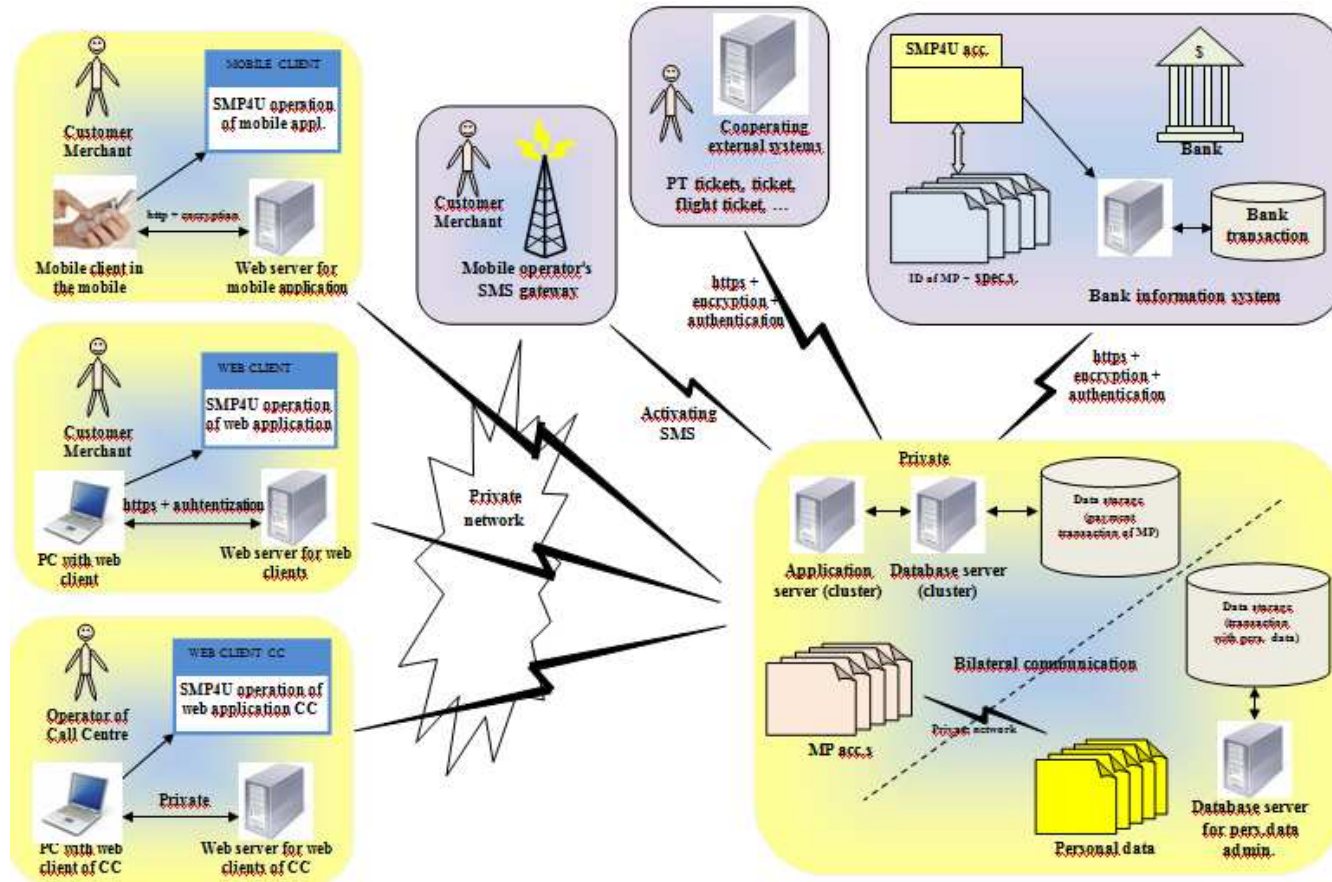
Table 12. Advances, Interests

ADVANCES + INTERESTS								
	number of mobile purses	average balance	interest p.a. %	income interest (advances)		advances from clients		interest revenue (op.acc., 0,5%;1%)
2011	0	0	0	0		0	10 000 000	
	0	0	0	0		0	0	
	0	0	0	0		0	0	
	0	0	0	0	0	0	10 000 000	0
2012	5 000	300	1,5	5 625		1 500 000	10 000 000	
	20 000	300	1,5	22 500		6 000 000	0	
	35 000	500	2	87 500		17 500 000	0	
	50 000	500	2	125 000	240 625	25 000 000	-167 803	243 083
2013	65 000	600	2	195 000		39 000 000	-167 803	
	80 000	600	2	240 000		48 000 000	0	
	95 000	700	2	332 500		66 500 000	0	
	110 000	700	2	385 000	1 152 500	77 000 000	31 494 348	1 160 332
2014	125 000	700	2,5	546 875		87 500 000	31 494 348	
	140 000	700	2,5	612 500		98 000 000	0	
	155 000	800	2,5	775 000		124 000 000	0	
	170 000	800	2,5	850 000	2 784 375	136 000 000	238 221 683	2 919 233
2015	185 000	800	3	1 110 000		148 000 000	238 221 683	
	200 000	800	3	1 200 000		160 000 000	0	
	215 000	900	3	1 451 250		193 500 000	0	
	230 000	900	3	1 552 500	5 313 750	207 000 000	578 067 671	5 721 895
2016	245 000	900	3	1 653 750		220 500 000	578 067 671	
	255 000	900	3	1 721 250		229 500 000	0	
	265 000	1 000	3	1 987 500		265 000 000	0	
	275 000	1 000	3	2 062 500	7 425 000	275 000 000	1 086 570 397	8 257 319

Resources: Own calculations

7.6 General description of SMP4U system

Figure 2. Description of SMP4U



Resource: Ing. Hynek Siedek, CSc.