

Online Payment Systems

1. Introduction

The ability to make electronic payments safe, efficient, competitive and innovative is a crucial and desired element for firms. Consumers and traders take the full advantage of the single market, especially in the current transition from physical trade into the electronic form. The world of selling goods and services in Europe is experiencing a fundamental change.

Given that, EU citizens and businesses are becoming increasingly active outside their country of origin, the possibility to use electronic payments across borders smoothly and significantly simplifies their daily lives.[1] Based on the results, obtained in the field of retail payments, Europe has the opportunity to move towards future technologies as far as payments are concerned, whether it is credit card payment on the Internet or by means of a mobile phone.

This paper examines the current spectrum of payments made by mobile phone or Internet card in Europe, especially in Romania, Poland and Russia, identifying discrepancies between the current situation and the vision of a fully integrated payments market [2], as well as the barriers which led to those discrepancies.

2. General aspects of payment systems

In every economy, a large number of transactions take place each day on the initiative of a wide range of economic actors. All transactions, whether they involve the acquisition of goods, financial assets or services, have two settlement components:

- the delivery of the goods or service,
- the transfer of funds – i.e. payment using cash (banknotes and coins) or deposits,
- held with banks (funds in accounts held with banks).

A payment is therefore a transfer of funds which discharges an obligation on the part of a payer vis-a-vis a payee. A payer is the party to a payment transaction which issues the payment order or agrees to the transfer of funds to the payee.

A payee – or beneficiary – is the final recipient of funds [3].

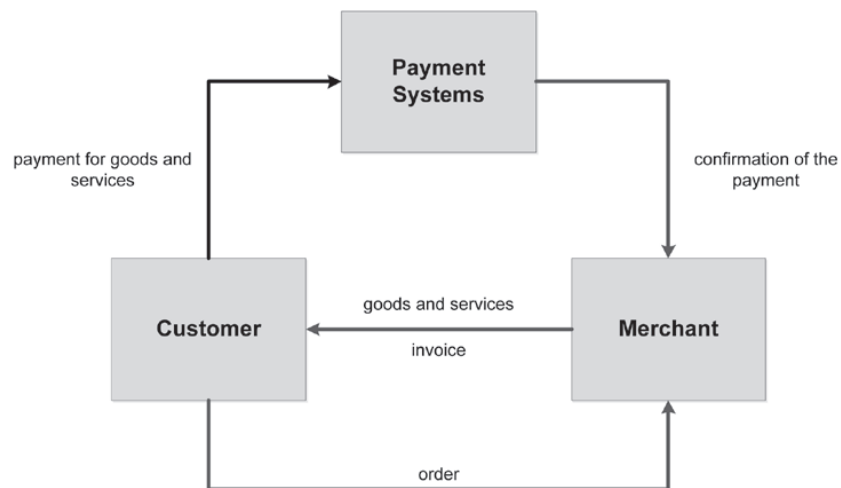


Fig. 1. A typical e-commerce scenario¹

2.1. The principal payment instruments (credit transfers and direct debits)

Operations for Credit transfers and direct debits are the only payment instruments which specify pan-European payment systems, namely the rules: SEPA²Credit Transfer³ and SEPA Direct Debit⁴ and those developed by the EPC for⁵.

In December 2010, the Commission presented a proposal in order to regulate the establishing mandatory deadlines by which the national payments systems migrate to the pan [4]. Once this important step has been completed, it will provide the basis for further market integration in terms of payment instruments and channels described below [5].

¹ Own elaboration.

² Single Euro Payments Area.

³ SCT.

⁴ SDD.

⁵ European Payments Council.

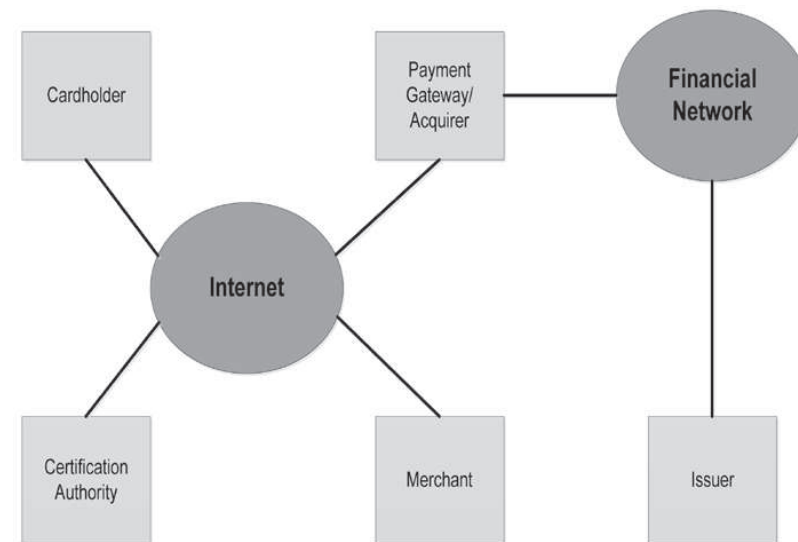


Fig. 2. System architecture of electronic payment system [6]

2.2. Payment systems

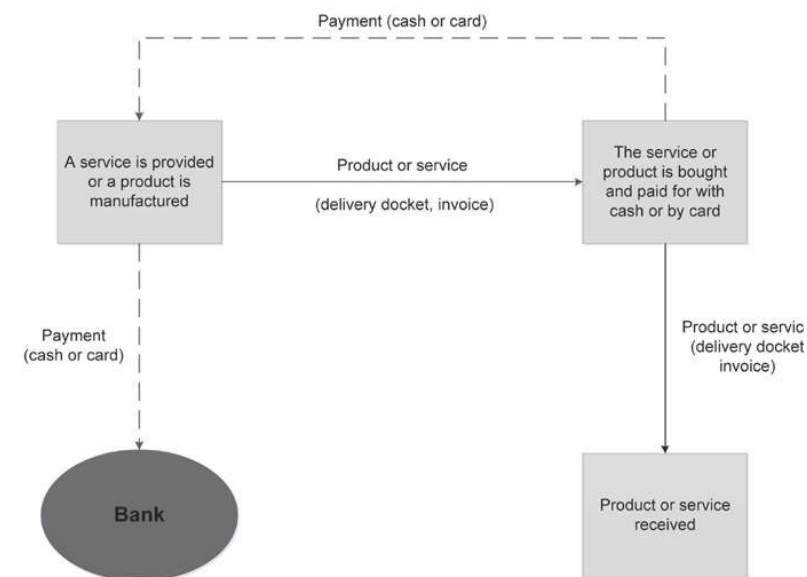


Fig. 3. Paying for goods and services in the traditional way [7]

2.2.1. Payment cards

Payment card is the most commonly used electronic payment instrument for retail payments. In terms of volume (the number of transactions), card payments in 2009 accounted for one third of all retail payments. In the EU, about 726 million payment cards were used, representing 1.45 cards per capita. On average, EU consumers spent 2 194 EUR per card in 43 card transactions at points of sale [5].

However, the integration of the European market for payment cards is far from being completed and tangible results are still limited. The strong growth in the volume of card payments in the last decade and the effects of major findings resulted in a significant decrease in costs to consumers and interchange fees or paid by merchants. In addition, national debit card systems are not always accepted outside the Member State of origin, which prevents the development of the single market. The fraudulent use of payment cards also remains a problem, especially in terms of remote operations [5].

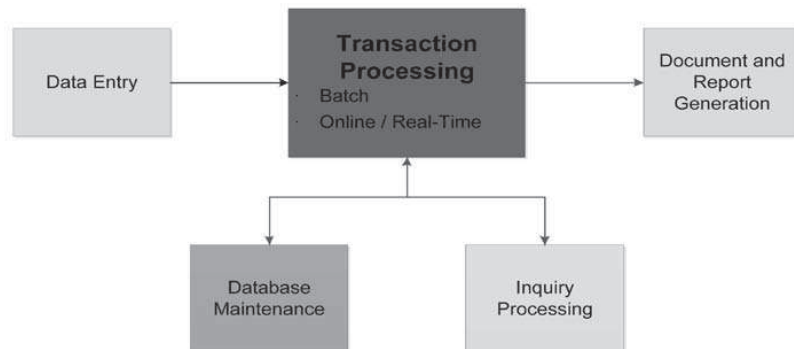


Fig. 4. The transaction Processing Cycle [8]

2.2.1.1. Credit card

In online Payments an Internet Merchant Service and a Payment Service Provider are needed to collect card details over the Internet. A Payment Service Provider acts like a virtual PDQ⁶ machine. The bank carries out the transaction through credit checks and charges the customer for the service. To make card transactions, there are two steps: Authorization and Capture. Authorization is the process where the credit card is verified. Here the card possessor will respond to the authorization request with one of these three answers: accepted, rejected or invalid data and the capture is when the card is actually debited [9].

⁶ Colloquial.: Pretty Damned (or darn) Quick(ly).

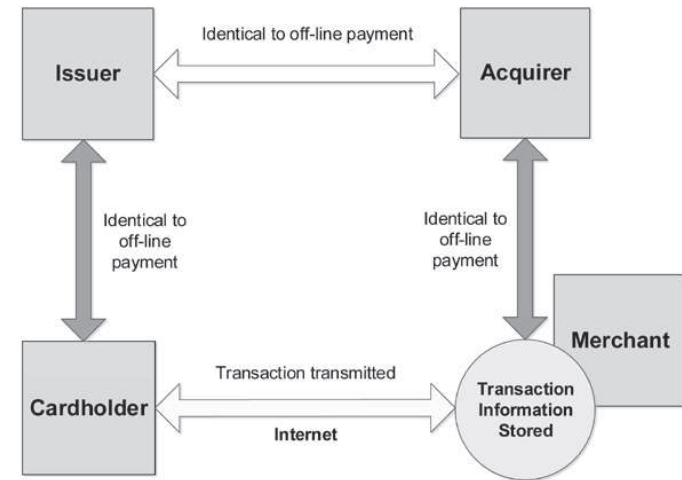


Fig. 5. Security of payment card transactions [10]

2.2.1.2. E-Wallet

This software, residing as a plug-in in the Web browser, enables a cardholder to conduct online transactions, store digital certificates and manage payment receipts. Like in the real wallet, in your digital wallet you can store your credit card number and details for shipping. This wallet initiates the data encryption in a SET⁷ transaction [11].

2.2.1.3 Smart card

A smart card is about the size of a credit card, made of plastic with an embedded microprocessor chip that holds important financial and personal information. The microprocessor chip is loaded with the relevant information and periodically recharged. In addition to these pieces of information, the systems to store cash onto the chip have been developed. The money on the card is saved in an encrypted form and is protected by a password to ensure the security of the smart card solution [12].

2.2.2. Internet payments (e-payments)

Electronic payments are payments made via the Internet, usually in one of the three ways:

1. Making a payment card transactions remotely via the Internet.
2. Credit transfer or direct debit online banking, where the payer uses an online portal for authentication (currently it works only at the national level)⁸.

⁷ Secure Electronic Transaction.

⁸ These operations can be performed either directly through online banking payer system, or through a third party (eg, Ideal in Benelux, Giropay and Sofortüberweisung EPS in Germany or in Austria).

3. Payments through electronic payment providers, where consumers create their individual accounts. Accounts can be powered by the “traditional” payment, for example bank transfers or credit card payments.

With the development of electronic commerce (buying and selling products on the Internet), electronic payments play an increasingly important role. According to Forrester Research, the number of people shopping online in Europe will increase from 141 million in 2009 to 190 million by 2014. In the next five years, the annual growth rates of e-commerce market are estimated at around 10%. According to estimates, the average expenditure per capita in the EU will increase from 483 EUR in 2009 to 601 EUR in 2014. Considering its considerable growth potential, electronic commerce currently represents only 3.4% of total retail trade in Europe⁹, so there are growth resources yet untapped.

Following a public consultation on the prospects of e-commerce, payments have been identified as one of the main obstacles that hamper future growth of e-commerce. Among other key issues identified in the consultation, a variety of methods of payment are used in Member States i.e. the costs of payments to consumers and traders, especially for low value payments (micro-payments) and payment security. In the absence of a (self) regulatory coherent and comprehensive European electronic payments, the environment is largely fragmented from one country to another, with a small number of efficient, national electronic payment systems and a limited number of major international players outside Europe [2].

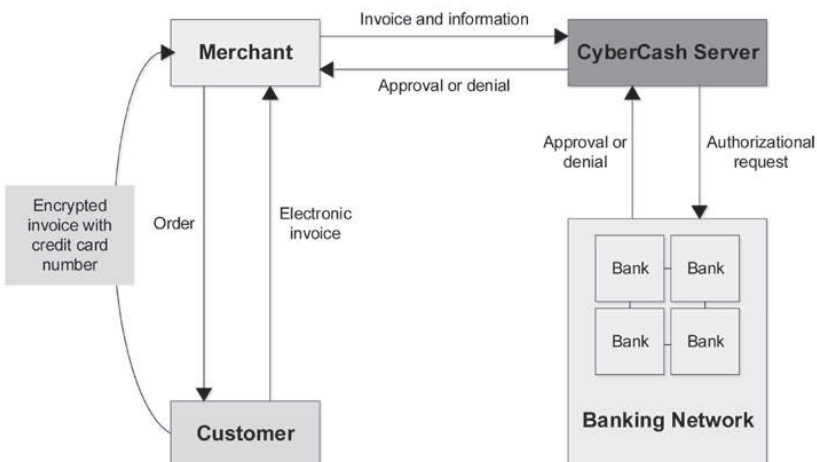


Fig. 6. An Online Payment Using Cybercash Software [13].

⁹ Euromonitor 2010.

2.2.3. Payments made by mobile phone

Payments made by mobile phone are those in which payment data and instructions are initiated, transmitted or confirmed via a phone or mobile device. They can be made for online purchase or offline services, for both digital or physical goods. The figure included presents an example case of a mobile payment process.

NFC - Near Field Communication is a set of short-range wireless technologies, typically requiring a distance of 4cm or less to initiate a connection. NFC allows you to share small payloads of data between an NFC tag and an Android-powered device, or between two Android-powered devices [15].

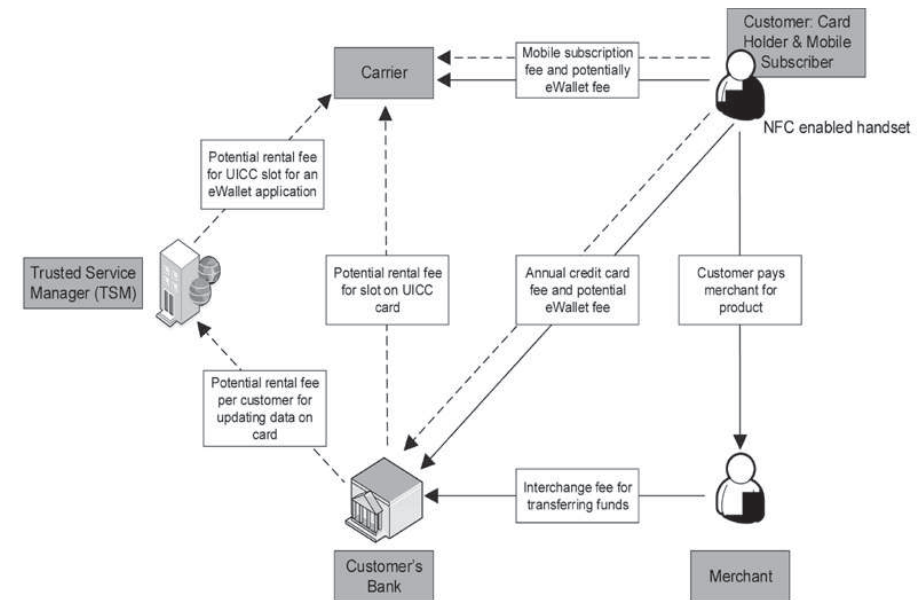


Fig. 7. Monetary Flow for NFC Mobile Payment [14]

Mobile phone payments can be classified in two main categories:

1. Distance payments (remote payments) are made mainly through internet / WAP¹⁰ or SMS¹¹, premium services that are invoiced to the payer through mobile network operator.

¹⁰ WAP (Wireless Application Protocol) was developed by the Open Mobile Alliance (OMA), a forum for stakeholders in the field in which they agree on common specifications for the mobile industry. A WAP browser is a web browser commonly used for mobile phones.

¹¹ Short Message Service.

Most remote payments made via the Internet are currently based on payment card systems. Other solutions based on credit transfers or direct debits are technically feasible and can be as safe, efficient and competitive, though some difficulties on the market appear [16].

- Proximity payments are generally performed directly at the point of sale. This type of payments using NFC¹² proximity, best technology currently available, requires specially equipped phones that can be recognized by reading devices at a point of sale (for example, in shops, on public transport or parking).

2.3. Advantages and disadvantages of electronic payment instruments

The electronic market payment instruments are modern payments constantly evolving, and considerable progress in the number of users and operation holders has been recorded in recent years, despite the economic and financial turmoil manifested in the world. The advantages that the electronic payment instruments have are numerically superior to the disadvantages of these modern means of payment. Out of all the difficulties encountered in transactions by electronic payment instruments, the most prevalent and constantly evolving is a fraud, becoming an international crime phenomenon.

The upward trend of the development of electronic payment instruments is in a close relationship with the whole international process of globalization. For this reason, issuers and law enforcement authorities are struggling and advising their clients to prevent security incidents and not to become the victims of potential attackers. In spite of implementing the security measures, fraudsters have specialized and constantly use new methods, however some still work by primitive methods, managing to defraud both the user and the issuing institution. As a consequence the financial losses are considerable, at least for the consumers.

2.4 Security and Infrastructure for online payments

2.4.1. Secure Socket Layer

SSL¹³ is a widely used secure service system and is an important measure to establish the trust and safety between an online buyer and seller. (OECD¹⁴, 2005b). To exemplify the idea two notions must be mentioned, i.e.: encryption and decryption that allow secure transfer of information between an Internet browser and server (for example between buyer and seller). Data cannot be changed or identified during the transmission. SSL also permits merchant identification through SSL server certificates.

¹² Near Field Communication.

¹³ Secure Socket Layer.

¹⁴ Organisation for Economic Co-operation and Development.

The SSL standard has been widely adopted because it is relatively simple and easy to use and does not place excessive demands on the average consumer's home PC, while at the same time reducing major concerns about the public character of the communication infrastructure [17].

2.4.2. Secure Electronic Transaction

SET¹⁵ is an alternative, more complex security system based on digital signatures and certificates¹⁶.

SET needs specific software and is more difficult for cardholders to use and obtain, and despite the big level of security offered it has not gained widespread use [17].

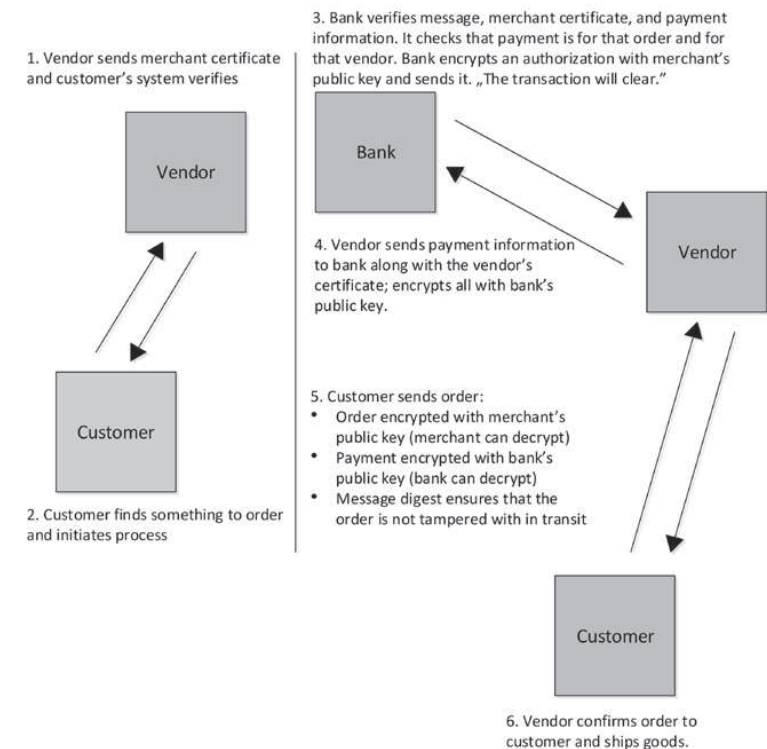


Fig. 8. The Secure Electronic Transaction Payment Process [19]

¹⁵ Secure Electronic Transaction.

¹⁶ In a SET transaction the customer, retailer and bank mutually prove their identity with digital certificates and digital signatures and all security-relevant transaction data are secured by encryption. The merchant does not receive any financial information and the bank does not receive any on the purchase or the seller.

The SET system is not itself a payment system, but rather a set of security protocols that enable users to utilize the existing credit card payment infrastructure on an open network in a secure mode [18].

SET's main advantage over other systems is that it is designed to be interoperable. Most payment systems today require both parties have a relationship with the same company or implement the same software. SET also has limitations, at least in the first version. For example, SET only accepts credit cards and related debit cards that do not require a personal identification number (PIN).

Most SET-based transactions will be processed via credit card. Typical debit cards and forms of digital cash may be added in later versions of the protocol. SET is limited in the type of transactions it can process; straightforward purchases, returns, and voids can be handled, but not more complex payment scenarios such as installment payments. SET is becoming more widely adopted, and vendors continue working on implementations and trials of the transaction system [19].

2.4.3. Digital Signatures

The digital signatures are a type of asymmetric cryptography used to simulate the security properties of a signature in digital form. Digital signature schemes normally have the following two algorithms: one for signing which implies the user's secret or private key, and another one for verifying signatures which implies the user's public key.

These types are often used to implement electronic signatures, a broader term that refers to any electronic data that carries the intention of a signature, however not all electronic signatures use digital signatures [20].

2.4.4. Certificate Authority

A CA¹⁷ is a body either private or public, that seeks to fill the need for trusted third party services in e-commerce.

In the context of credit cards, the CCA¹⁸ emit the certificate to cardholders, the MCA¹⁹ to merchants who operate e-stores and the payment portal certificate authority to payment portal service providers [20].

¹⁷ Certificate Authority.

¹⁸ Cardholder Certificate Authority.

¹⁹ Merchant Certificate Authority.

3. Online payment systems used in Romania, Poland and Russia

Owing to its unusually dynamic development, the Internet has been used for various commercial purposes with e-commerce as one of the most important applications. This market has already become a vital segment of retail in many countries all over the world. However, the degree of e-commerce development depends on many factors, including the availability of the Internet, the activity of users as regards shopping, the level of trust in online transactions in society, and the amount of a household's disposable income per capita. Consequently, there exist considerable differences in the use of e-commerce and payment methods in particular countries [21].

3.1. Poland

Customers in Poland can choose from a wide range of payment methods, including various forms of cash payments, cards and mobile payments, as well as totally virtual instruments. Due to customers' concerns about the security of online transactions, the usefulness of pre-paid instruments (limiting the amount of possible losses resulting from fraudulent transactions) is much greater than that of payments in the local Points of Sale.

At the end of the 20th and the beginning of the 21st centuries e-commerce played a minor role in Poland. It was just in 2004 that one could observe the start of dynamic development of e-commerce in Poland. According to IAB data the first time e-commerce accounted for 1% of total retail trade in Poland, in 2005. In 2007 the Polish e-commerce turnover increased by 61% and equaled 8.07 billion PLN. A typical feature of the Polish Internet market is a considerable share of online auction markets, accounting for 50 to 60% of the total turnover. In 2007 the value of the <http://www.allegro.pl> auction market turnover, the leader in the Polish Internet auction markets, increased to 3.9 billion PLN (an annual increase of 56%).

The other four leading auction systems had their turnover estimated at about 0.7 billion PLN, whereas approximately 4,000 online shops recorded a total turnover of more than PLN 3.4 billion. It must be remarked that a part of the Internet shops turnover is generated through online auctions where the shops offer their products. The e-commerce development in Poland is stimulated by a dynamically increasing number of Internet users, which rose from 8.8 million to 14.1 million between 2005 and 2007²⁰. The survey research commissioned by the National Bank of Poland in 2008 showed that the structure of payment methods used in e-commerce in Poland significantly differs from that observed on the main world markets [22].

²⁰ Internet World Stats, 2008.

3.2. Romania

Romanian consumers primarily use off-line payment methods such as cash-on-delivery and bank transfers to pay for online purchases. Credit and debit cards are rarely used. In 2011, the value of card payment transactions reached 18.03 million RON. Out of 9 million cards in Romania, only 200,000 have the 3D secure standard activated, which is used by the Verified by Visa system. The e-commerce market exceeded 160 million EUR by the end of 2011 [23]. During the first three quarters of 2011, the volume of on-line payments increased by 11% as compared to the same period last year, reaching 121.4 million EUR [24].

Consumers use a single bank account for all payment transactions, even if they live in another country of origin or are frequent travelers to the EU. By accelerating innovation, payments become more affordable and adapted to the specific circumstances of each purchase (online/off-line retail payment/payment of high/big value, etc.).

Companies and public administrations are able to simplify and streamline the payment processes and centralize financial transactions made in the EU and in Romania. This creates a significant potential for savings. Moreover, common open standards make faster payment transactions and improve cash flow.

Traders may, in turn, benefit from cheap electronic payment solutions, efficient and secure. Increased competition makes manual handling of cash alternatives more attractive. Also, the shift to e-commerce becomes more compelling and satisfying for customer [25].

3.3. Russia

The market of electronic currencies in Russia is young, but already very aggressive. Just like with social search, it is dominated by local players, leaving the world-known brands behind [26].

3.3.1. The structure of payment methods in Russia

Even though cash is still the most common way to pay for online shopping in Russia, other methods of payment are becoming more and more used. According to the latest TNS²¹ research, 35% of the respondents use credit cards for making online purchases, 27% – electronic currencies, and 17% – online banking services. Between these, e-currencies usage demonstrates the fastest growth.

Market turnover doubled in 2011 reaching 125 billion Russian rubles (around 4.2 billion US dollars).

²¹ Taylor Nelson Sofres is a leading market research and market information group.

In Russia, there are 34 million active e-currency accounts. The most important electronic money transfer system is Yandex-owned by Yandex Money (15%), followed by Qiwi purse (10%) and WebMoney (10%). PayPal is still struggling in Russia holding 6% market share. E-Currency from www.Mail.ru, Money.Mail.ru managed to gain 2% market share since the launch in 2010.

In certain segments electronic money is more used than in others. 36% of all payments for mobile/telecom services and 38% of all social networking services are paid with e-currencies, for example, or others. The respondents of the TNS research say that they used electronic money at least once for paying for products or services during the last 6 months.

It must, however, be noted that the survey was conducted on a specific target group: people who are between 18 and 45 years old, and live in larger cities (from 800 000 inhabitants). The country-wide statistics would certainly bring slightly different results.

3.4. Most common online payment systems

Yandex Money

Yandex is a popular Russian search engine, which offers its users opening of an electronic wallet that can be used for sending and receiving online payment. It is a reliable and safe system, which, however, suffered from a series of money pyramid schemes was spread by its users over the Internet [27].

RBK Money

RBK Money was formerly known as the RUpay payment system. It is a very common system used to pay for online utility bills and shopping in Russian online stores. In the section with Special Offers one can find plenty of great deals and discounts for those who use RBK Money [28].

MoneyMail

Like RBK Money, MoneyMail can be used to pay for utility, Internet services, phone, or a loan. There is also an option to send money to someone using only the person's email address. Shopping online using Russian websites is a rewarding experience with MoneyMail.

Moneta.ru

Among basic services that are offered by other payment systems, Moneta.ru offers currency exchange, which allows users to exchange e-money of some Russian payment systems, such as Yandex Money, or transfer money from their banking account to their online Moneta.ru account [29].

Paypal

PayPal, being the world's leading electronic money transfer provider, is having a hard time in Russia. With its 6% market share, PayPal is mainly used when buying products on eBay (up to 90% of all Russian PayPal transfers). Interestingly, the opponents, who more or less copied their model of business, are very skeptical about chances of PayPal's in Russia.

Dotpay

Dotpay is one of the most popular payment systems in Poland. It offers a wide range of services, from cash payments to the performance of payment transactions using telecommunication, digital or informatics systems. Dotpay is often used in the payment system because its range covers countries all over the world.

PayU

The Polish PayU is designed mainly to set up the account necessary to e-purchase with the possibility of shopping in many online stores. A PayU account ensures rate, convenience and security of online purchases.

4. Development of the conduct of the experiment

In the full cycle of studies about using electronic payment, the experiment plays the key role.

Despite the fundamental meaning of the experiment in scientific studies, there is not a full agreement about the definition among scientists. For the purpose of this paper it is assumed that the experiment will be any deliberate action directed at established research facility that the stimulation of passive observation of object will provide the information necessary to achieve that objective tests.

Execution of the experiment was preceded by performing a series of actions:

- opening a bank account with an on-line function;
- modifying the telecommunication system;
- modifying the existing information system;
- implementing electronic banking systems;
- integrating the telecommunication and information system;
- securing the tele-informatics system;
- selecting the electronic payment platforms;
- taking part in intensive training of English and German language skills for people who are participating in the experiment.

Other actions preceded by the experiment were related with participating in HKTDC in Hong Kong, visiting selected factories in Shenzhen, China and participating in CeBIT in Hanover. During the visits, a lot of material was acquired related to the functioning of economy in Asia and Europe, especially aspects such as the law, B2B platform, electronic payments, B2C. While staying in Asia, quite a flexible approach to legal issues may be noted. The experiment confirmed that in the case of commercial trade with Asian companies, caution should be exercised in such matters as payments, quality of products, the timing of delivery, CE, complaints. Reasons for optimism in legal issues may be found in visible efforts of governments and commercial institutions of China and Hong Kong. There appear a number of publications on this subject, for example: "A Guide to Doing Business in China".

Process of the experiment

The company that took part in the experiment used the B2B and B2C platforms to make purchases of goods and services in various countries of the world. In this case, the transactions were made in countries such as the United States, the United Kingdom, India and Germany.

All payments were made by the PayPal system, credit cards and electronic banking transfer. Using the PayPal system, 24 transactions were performed, four of which in the Euro currency, 7 in British pounds and 13 in U.S. dollars.

The value of the purchased goods in the case of one single transaction does not exceed 128 Euros, 140 U.S. dollars and 15 British pounds. There were no problems in the process of making payment. In the case of one transaction made in Hong Kong the money was returned due to a lack of capacity to perform the order. This occurred in one month from the date of order. This method of payment has proven to be the fastest and most convenient. The use of credit card payments occurred in 12 cases, one of which in amazon.com, 2 in *www.amazon.com.de* and 5 in amazon.co.uk. Also 4 transaction were made in foreign online stores. There were not any problems with any case. Each transaction was confirmed by sending emails.

5. Conclusions

The experiment has provided new insights into the possible use of electronic payment systems, both in Poland and abroad. Regarding the range of the executed experiment, it is worth noting that it was limited to the examination of the use of electronic payments by SMEs. The experiment clearly confirmed the legitimacy of the traditional methods of contacts with suppliers by computing resources. Using B2B portals, B2C auction systems and payment systems to pay their dues, will provide additional opportunities to reach suppliers and customers all over the world.

It is noted that the entrepreneurs properly associated innovations with www services and electronic payments. Obviously, the article specifically highlights intense activity in this field, however in case of international transaction, there were no rewarding results.

The company that takes part in the experiment repeatedly participated in trainings co-funded by EU's concerned e-business. However, in the case of other companies the problem seems to be that the benefits are seen after a certain time. Entrepreneurs are more interested in the activities, which will cause the appearance of profits in a short time. In addition, they are afraid of the risk connected with making payments in the electronic way. Lack of knowledge in this field means that entrepreneurs often get discouraged and do not undertake any activity in this area. This paper shows that it is possible to implement in a rapid and effective way electronic payment systems at a low cost and minimal risk. The problem is the lack of flexible solutions of models, where they can be implemented within a short time.

To improve the current situation, certainly trainings organized in e-business area may prove helpful, as well as increasingly used in practical solutions in the field of virtualization, cloud computing and business intelligence. These technologies can deliver rational benefits in a short time at low costs of investments. It found its confirmation in the e-payments solutions presented in the field of E-commerce Park during the CeBIT IT fair in Hanover. More details may be found at: www.cebit.de.

In conclusion, it should be noted that the use of electronic payment technologies by SMEs to conduct global commerce is inevitable. There is a noticeable difference between Poland, Romania, Russia and the highly developed countries. Due to concerns of Polish entrepreneurs and emerging threats, electronic commerce is not widely used. Contrary to the opinion of many experts, despite the progress in information technology at the current stage of development, it is necessary to know the English language at least at a basic level. Structures of telecommunication and information systems at SMEs should be appropriately adapted to the needs of e-payment, taking into account factors such as safety, low cost, rate of payment, ease of implementation and ease of use.

Electronic payments, credit cards or mobile phone payments seem to be an increasingly popular trend in all the countries of the world. The rate and convenience of transactions attract a growing number of customers by offering more solutions in shorter time of execution, which nowadays is a huge advantage of the electronic commerce market.

List of abbreviations

ATM – Automated Teller Machine
 CA – Certificate Authority
 CCA – Cardholder Certificate Authority
 EPC – European Payments Council
 MCA – Merchant Certificate Authority
 NFC – Near field communication
 OECD – Organization for Economic Co-operation and Development
 PIN – Personal Identification Number
 RFID – Radio-Frequency Identification
 SCT – SEPA Credit Transfer
 SDD – SEPA Direct Debit
 SEPA – Single Euro Payments Area
 SET – Secure Electronic Transaction
 SMS – Short Message Service
 SSL – Secure Socket Layer
 TNS – Taylor Nelson Sofres
 WAP – Wireless Application Protocol

Streszczenie

System płatności online

Niniejsza praca naukowa przedstawia aspekty dotyczące elektronicznych systemów płatniczych. Zaprezentowano i przeanalizowano w niej kilka wybranych i istniejących systemów. Systemy płatnicze są istotnym elementem w procesie handlu elektronicznego. Handel elektroniczny lub w skrócie e-handel jest pojęciem, które oznacza proces kupna-sprzedaży lub wymiany produktów, usług i informacji, z wykorzystaniem różnych sieci komputerowych włącznie z Internetem. W większości przypadków, e-handel jest ściśle związany z systemami płatności, które prowadzą do tworzenia niektórych rodzajów pieniądza elektronicznego oraz niektórych specyficznych usług płatniczych. W tej pracy zostały opisane mechanizmy płatności, architektura i funkcje elektronicznego systemu płatności i e-pieniądza.

Wraz z elektronicznym systemem płatności, pojawiły się również przestępstwa i nadużycia internetowe.

Summary

Online Payment Systems

The paper presents aspects concerning online payment systems. Several selected and existing systems are presented and analyzed. Payment systems are vital elements in the process of e-commerce.

The electronic commerce or E-Commerce is a concept that represents the buy and sale process or exchange of the products, services, information, using a computer network, inclusively the Internet. In the majority of cases, E-Commerce is closely linked to payment systems that lead to creation of kinds of electronic money and specific payment services. The payment mechanisms, the architecture, the functions of the online payment system and E-Cash are described. Along with the online payment systems Internet fraud and cheating appeared. To prepare this article, information available from the Internet, as well as the official websites of government institutions, banks, portals, European Union, national and international media was used.

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