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Systems for Online Payment: E-banking, E-commerce and Digital Currency

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Abstrac

The future of the banking and financial world is tightly connected with ICT technologies, it works and relies on them. Currently there are more digital moneys circulating the world than traditional paper money. Most of the banking transactions today are done through the means of e-banking and m-banking. It is fair to assume that in the near future we will witness a global redefinition of the banking system, payment network, currencies and financial transactions as we know them today. New paradigms are emerging, ICT companies primarily based in the Silicon Valley with their inventions are threatening the traditional banking world. New digital currencies, e-banks and way of doing online transactions is a reality in the developed countries. We are experiencing the rise of the new digital currency which are governed by decentralized banking systems and are not under control of any government. In the new future, traditional banking will be something of our past.

Keywords: Digital currency, e-banking, e-commerce, PayPal, Facebook Credits, Amazon Coins, Bitcoin

1. Introduction

This paper is oriented in analyzing and comparing different systems for online payments, e-banking and m-banking, e-commerce, and digital currencies. We are introducing a comparative analysis between the banking system in Macedonia and Canada, we observed their functionality and at the same time analyze the differenced and similarities between the two. We are analyzing Bitcoin as the digital currency of the future and PayPal as the payment system of the future. We are also briefly introducing Facebook Credits and Amazon Coins. For the purpose of this paper we have conducted questioners on representative samples in Macedonia and Canada, to see differences in the utilizations of the e-banking, m-banking, and telephone banking on one side, versus the use of a traditional banking system in this two countries, and the use of PayPal and bitcoin in everyday life. We took Macedonia as a representative of a typically developing country and Canada as a representative of a highly developed country. To sum up, we are exposing all the major players in the digital field of financial and banking service, trends that are emerging, and practices that will redefine this industry.

2. Services for online payments

There are different types of services for online payments that are popular and in use today. They are usually used for payment of purchases made on e-commerce sites like eBay or Amazon. The research is showing increase in the online payments [1]. PayPal is the biggest online payment service today [2]

followed by other services like Google Wallet, Skrill, 2Checkout etc. PayPal popularity and usage is dramatically increasing every year. According the recent poll [3] there is huge increase in usage even in not (very) developed regions like middle east where there is 15% increase of PayPal usage from 2012-2015 of the all transaction made by any payment method. Also, PayPal has a dramatic increase in the payments made from smartphones\tablets [4]. 15.1% of all the payments made my smartphones/tables is made with PayPal service [5].

The rise of PayPal is mostly due to eBay. As an example 80% of the products that are sold here as preferred method for payment have PayPal. Most of the PayPal revenue is contributed by eBay [6]. Even though most of the growth of PayPal is due to eBay, PayPal is growing much faster than eBay [7]. PayPal growth is partially due to its ease of implementation. PayPal Virtual Terminal [8] is ready made solution that can easily be integrated and implemented in any e-commerce website.

3. E-Banking

E-banking is electronic payment system that allows bank clients and financial institution to perform financial transaction on the bank website. The origins of the e-banking dates back to 1981 in New York where four big banks Citibank, Chase Manhattan, Chemical and Manufacturers Hanover began with e-banking services through videotext system [9]. This was a failed attempt without any success at that time. However, this system become popular in Europe, mainly France and UK where the telecom provider Minter (France) and Prestel (UK) were offering this system [10].

In the UK the first online banking service was known as Homelink [11] and was implemented from Bank of Scotland for the clients of Nottingham Building Society (NBS) in 1983. This system was based on Prestel. Stanford Federal Credit Union was the first financial institution that offered e-banking to its clients in October 1994 [12].

M-banking is new branch of e-banking that developed rapidly in the past few years. E-banking is experiencing dramatic increase, especially in the well developed countries, and this is partially due to m-banking [13]. Research shows that 61% of the internet users do online banking whereas 35% of the cell phone owners use mobile banking [14].

The demographic distribution is even more interesting [15]. There is not much differences between the number of man and woman that are using e-banking. From ethnic perspective Caucasians and Hispanic use much more e-banking (63%/ and 62%) compared to Black population (48%). On the age scale, e-banking is more popular in younger population. Education also plays role in sense that the higher the average education level of a population the more e-banking it is using. Namely 75% of users with college degree and higher use e-banking, and only 30% of those with no high school diploma. The same apply to the income as people with higher income tend to use e-banking more. Specifically those that earn more then 75 000 \$ annually use 75% e-banking whereas those that earn less than 30 000 \$ use only 48% e-banking. Also the urbanity of the population plays a role, those that live in urban and suburban areas use 62% e-banking whereas those in rural areas only 42%.

In US the usage of e-banking and m-banking is proportional with the age of the population. Around 50% of the population between 18-25 years are using it, 47% of the population between 26 and 34 years whereas on the lower end only 6% of the population above 65 uses e/m-banking [16]. Regarding the usage by world regions, leaders are Asia and Pacific, followed by Europe and South America. Interestingly North America is the last. Traditional banking is most popular in South America [17]. ABA (American Bankers Association) research is showing that e-banking is the most preferred method for doing banking transaction by 39% of the population, traditional banking is preferred by 18% of

population, ATM machine are preferable by 12%, followed by Telephone banking (9%), e-mail banking (8%), m-banking (6%) [18].

4. Bitcoin

Bitcoin is a new digital currency that is not regulated by any government or central bank in the world. It can easily be compared to the gold in a sense that no-one owns it or regulates it, and its value depends on the market need. Another aspect of the comparison is that to excavate gold is pretty hard and that process requires resources and time. Same applies to Bitcoin where one need to do a process known as mining that includes lot of CPU work to calculate complex mathematical problems in order to use Bitcoin.

In its essence, it is a currency as any other that can be used on the market. In its simplest, currency is a medium for trade of good and services. Everything that is rare and people wants to poses can be used as currency like gold or diamonds.

In contrast to the popular national currencies like USD, EUR, CAD and GBP, where we have central authority body that governs those currencies and determinates the inflation rate, Bitcoin is totally decentralized, there is central authority, central bank or central server.

If we continue the analogy with gold, we know that we have certain amount of gold reserves in the worlds and once they are all excavated and used there will be non-left. The less gold reserves we have the higher the price of it. Same is true for Bitcoin. There is fixed number of bitcoins that remains to be mined in the world.

4.1. Bitcoin mining

Bitcoin miners are bitcoin's central bank. They are mined in a software called Bitcoin Miner. This is a process in which the users were using theirs pc for the verification of the transaction that appear on the bitcoin network. As a reward for this job the users receives new bitcoins upon transaction completion verification. These are the bodies that release new bitcoins on the market and thus the analogy with a central bank [19].

The calculations that take place are complex hash calculations i.e. mathematical calculations that are irreversible. The speed of the mining process is proportional to the processing power of the CPU that is conducting the calculation. This process requires lot of energy and can easily overheat the CPU [20].

The number of hashes per second is the unit of speed in this process. 1H/s means that the CPU can do one hash function in a second, 1KH/s is 1000 hash functions performed in a second, 1MH/s is 1 million hash functions in a second.

Every second bitcoins are send and received through bitcoin network. Log is kept for every transaction made. All the transactions that are performed in a 10 minute interval are kept in a data unit called Block. These blocks that are group of transactions are connected with each other in a way that every new Block acknowledges the validity of the previous block. Blocks that are linked in this way are called Block chain.

Bitcoin network is designed in a manner that in every 60 minutes only 6 blocks can be made. The first transaction in a block is special because that is the transaction that creates new bitcoins that are in ownership of the creator of the Block. The creator of the block is the miner that is mining the bitcoins.

When users process transactions in a block one increases his rewards but also decreases the probability to earn reward because of the time it needs for this block to reach consensus, depends on its size. This scenario leads to a game situation between the miners. [21]

4.2. Bitcoin Chain

The Bitcoin Chain is essentially database that store records of all the bitcoin transactions that were ever made. Because there is no central server in the bitcoin network every user that is part of this network serve dual purpose: as a server and client in the same time. This is a peer-to-peer network. When the bitcoins are send from one address to another, the transaction get broadcasted i.e. gets sent to all the nodes that are directly adjacent to the nodes that is performing the transaction. The nodes that have received information about a transaction, retransmit that information to all the nodes that are directly adjacent and this process keep on going until the information about the transaction reaches all the nodes in the network.

Every node in the network has a copy of the block chain and therefore every node know about all the transactions that had ever happened. Depending on how many bitcoins you have sent and received, can be calculated how much you have in one moment. Every user has a unique ID on the network that identifies it. Because the database contains the history of all bitcoin transactions from the start with a simple search we can find out how many bitcoins certain user had received and send thus a user balance can be determined. This allows the bitcoins not to be stored on the user pc or end device, they are stored on the bitcoin network.

Bitcoin mining is performed in chunks i.e. number of hash calculations forms block. One block equals 25 bitcoins. If a user had calculated all the transactions on its own then he is the sole owner of all the bitcoins. If he had help from other users than the total value of the bitcoins is shared proportionally depending on the contribution of every user.

Crucial in this process is the fact that as the number of nodes in the network is increasing and the CPUs on which the calculations are made are more powerful, the complexity of the bitcoin calculations are more complex and require more time to be solved. The more clients there are on the network, the more hashes needs to be calculated for creation of one block. Popular software that is used for mining are: BGF Miner and CG Miner.

4.3. Bitcoins in the real world

Interesting research was conducted in which users of bitcoin were asked about the things that happened to them and were directly related to the use of the bitcoin [22]. 70% answered that they have learned something new about cryptography, 70% learn something new about financial markets, 63% learned about security anonymizers like TOR, 46% made a lot of money etc.

In another interesting research, users were asked on what they have spent the bitcoins [23]. 35% answered that they have used them for presents and donations, 31% used them for buying legal products, 26% for software and computer services and 11% for narcotics.

As expected, by the number of downloaded clients USA is leading followed by China, Germany, UK, Russia and Canada [24]. Surprisingly leading countries of bitcoin users per population of internet users are Ukraine and Belarus followed by Finland, Romania and Poland. Interestingly countries like Canada, Sweden, Australia and Russia are in front of the USA [25].

If we look at the popularity of bitcoins according to google searches results, the leading city is Moscow followed by Berlin, Melbourne and New York. For the search results for buying bitcoins leading cities are Warsaw and London [26].

5. Platform based digital currencies

The increase of internet usage throughout the world was followed with the appearances of various digital currencies. E-commerce, social networks and online gaming became important part of our life. Main player in this segment are Facebook and Amazon.

These platforms, for digital payment issue electronic tokens: Facebook Credits and Amazon Coins. This tokens can be used by users to buy real or virtual products on the platforms and are called digital currencies.

These global platforms are available worldwide and have millions of users. We need to make distinction between digital currencies and digitalization of national currencies like the US dollar. Digitalization of national currencies is process that includes electronic transfer of the national currency between different accounts with the use of credit or debit card.

On the contrary the digital currencies does not have its physical representation. There are two types of digital currencies:

- Centralized
- Decentralized

Example of centralized currencies are Facebook Credits and Amazon Coins. Behind this currencies we have central bodies that are the companies that have developed these currencies, and are controlling and regulating them. Example for decentralized digital currency is Bitcoin. No company or body controls and regulates this currency.

Platform based digital currencies are characterized by:

- The platform is controlling the supply of the currency to the market
- The platform is offering its currency as value for object

In mid-2009 Facebook had introduced its digital currency FB Credits. With these credits Facebook users can buy premium content for games and application. This credits can be earn by playing or doing some other stuff on Facebook or can be bought with credit or debit card in exchange for real currency. This credits can also be bought with PayPal.

Amazon Coins are similar to Facebook Credits in this regard as can also be bought with credit/debit card. The difference is in the fact that this coins are transferable i.e. you can donate them to your friends or family members. Also Amazon has practice of giving its coins to users for buying its products like Kindle Fire.

6. Practical work

For the purpose of this paper, we have conducted survey poll for the usage of e-banking, m-banking, telephone banking, traditional banking, and usage of PayPal and Bitcoin in Macedonia and Canada. This two counties were taken as example of highly developed and digitalized country as Canada on one side, and developing country like Macedonia on the other, in order to see the gap end difference between this two categories. Surveys were conducted with the help of Google Forms and were distributed to the end users by emails. In order to get as many answers as possible the survey was made to be simple and easy too answer, mostly consisting of YES/NO questions so the users will not spend more than 5 minutes answering the questions. The platform that was used for the survey automatically summarize results and does not allow one user to fill two surveys. As expected, the usage

of different types of banking differs drastically between the two countries. 17% of the users in Macedonia use e-banking whereas in Canada 89% of the users. This result is expected as when you open bank account in Canada you are getting e-banking access to your account by default. In Macedonia you can have bank account in a bank without having set up e-banking account. Usually one needs to apply for e-banking account and needs to have some kind of certificate or token used for authentication and authorization where everything in Canada is done by username and password, no transaction requires digital certificate.

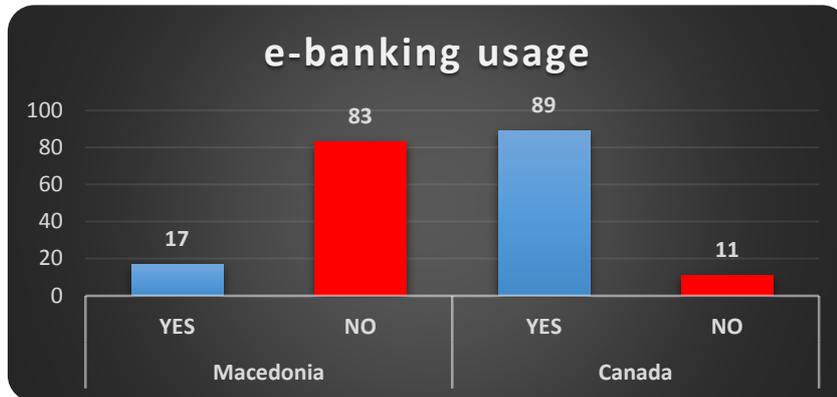


Figure 1. E-banking usage

The difference in m-banking usage is more drastic as only 11% of the users in Macedonia use it whereas in Canada this number is 76%. This high number in Canada is mainly due to the fact that most of the popular restaurants and coffee shops offer their own mobile apps that can be linked with your credit/debit card and when one go to pay via drive through or on a counter does not need to tap or slide its credit card but can do everything via tapping the smartphone to the reader.

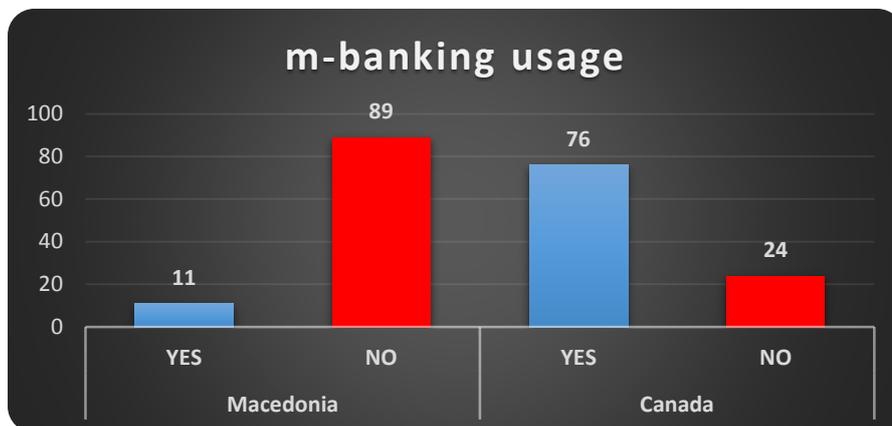


Figure 2. m-banking usage

Telephone banking is not much popular in Macedonia and therefore only 3% of the users are using it. In Canada 79% of the users are using telephone banking in one form or another. In Canada is very popular and fast to check your account balance through the phone, you just need to call certain number and enter pin number and the automated telephone system will tell you the exact amount. Also telephone banking is very convenient for setting up preauthorized bill payments.

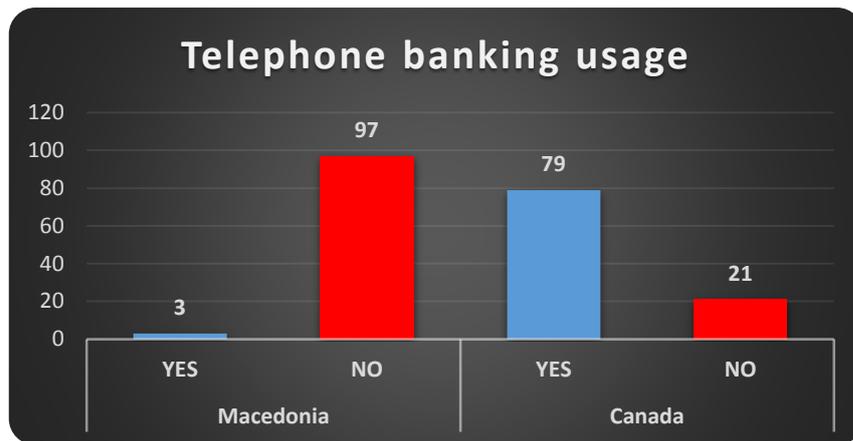


Figure 3. Telephone banking usage

Regarding the traditional banking i.e. visiting physical bank branch, in Macedonia 21% of the users at least once in a week go to bank branch, 23% go at least once in two weeks, 47% at least once in a month and only 9% go to the bank only twice in 6 months. In Canada the situation is different. 3% go to branch office one in a week, 7% go at least once in two weeks, 33% go to bank at least once in a month and 57% go to bank at least twice in 6 months.

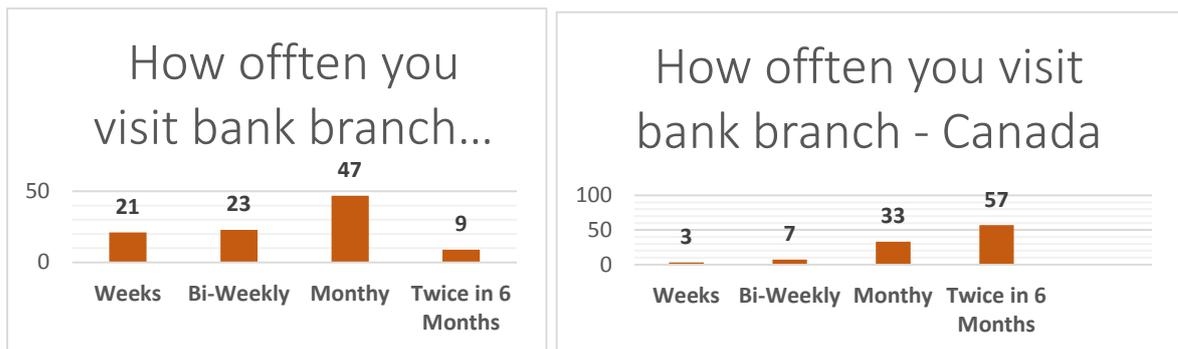


Figure 4. Patterns in bank branch visits

Usage of PayPal is very common in Canada where 56% of the users are using it whereas in Macedonia only 9% of the users had used PayPal at least once.

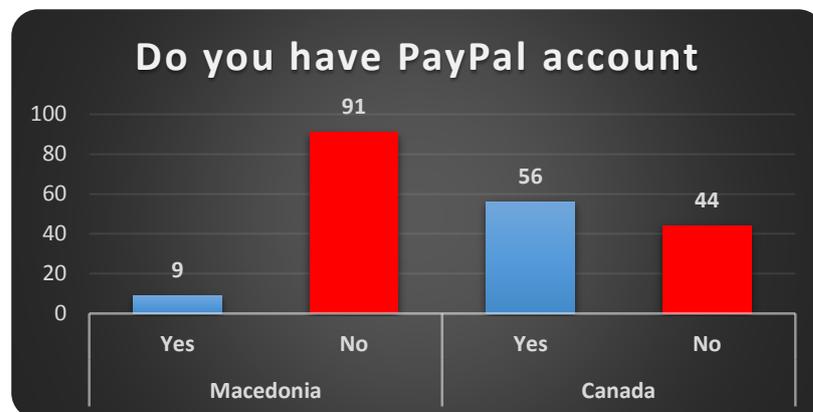


Figure 5. PayPal usage

Regarding the bitcoin usage, 4% of users in Macedonia is using it and 18% of the users in Canada are using it.

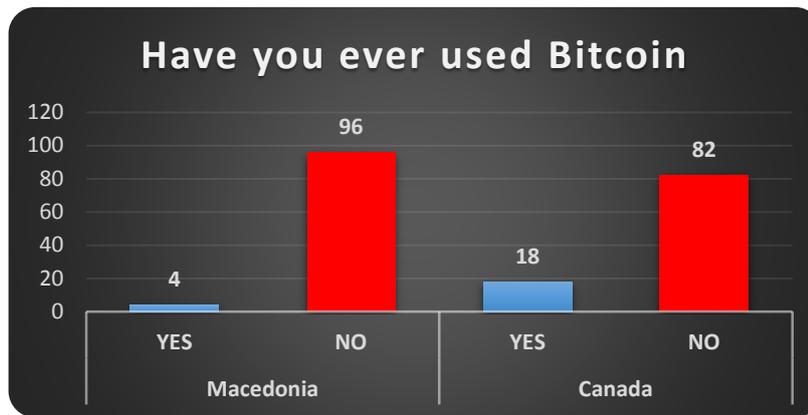


Figure 6. Bitcoin usage

Conclusion

In this paper we have analyzed and compared different banking systems, the influence of ICT on banking and financial services, online payment systems and digital currencies. We have analyzed usage patterns and growth in different regions of the world. The survey that was conducted shows difference and patters between typically developed country and development country. Our research outlined usage patterns for different types of banking like e-banking, m-banking, telephone banking and traditional banking. Main aspect is the gap between highly developed and developing countries. We discuss the reasons behind this findings as a guidelines that can be used for the developing countries to increase their usage of e/m – banking and online payment services. The analysis of Bitcoin currency and PayPal payment systems clearly shows that in the developing countries there are many obstacles in their usage. They are not that much common and popular. As a conclusion from all the research and analysis few recommendations can be made that if followed by the developing countries will decrease digital gap and will bring them closed to the highly developed countries:

- Users need to receive e-banking and m-banking accounts by default with the opening of standard checking/savings accounts
- Banks need to offer toll-free numbers for telephone banking
- Banks need to implement automated telephone systems with tele typing capabilities to enable its clients to perform simple transactions like balance checkup, payments, list of last transactions, due date of payments etc.
- Ease in performing online payments and transfers through e/m banking by means of simple authentication and authorization via username, password and security questions.
- Removal of usage of digital certificates and tokens as a pre-requirements for digital money transfer and payments.
- Introduction of simple pin authentication or authentication with answering of security questions for telephone banking.
- Legislation and government control over the financial institutions needs to be eased to allow services like PayPal to enter this market.

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