Experience and challenges of implementing digital health solutions as innovative tools in healthcare

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The main advantages of cryptocurrency are justified: confidentiality and, therefore, the security of owner data; independence from the state; absence of territorial and time constraints in transactions; low cost of service, etc. The advantages and disadvantages of using cryptocurrency in the period of exacerbation of economic crisis are presented. The global experience of legal and market regulation of cryptocurrency circulation is considered. Prospects for the further functioning of cryptocurrency as a financial innovation in modern economic systems are outlined.

Keywords: cryptocurrency; capitalization; financial innovation; blockchain technology; Bitcoin.

Introduction

The formation of an innovative society and the rapid development of high technology in different part of public life led to the appearance of a large number of innovations, including in the sphere of financial and the Internet technologies. Such innovations include the so-called cryptocurrency, which is gradually spreading around the world and it is already widely used as a means of payment. Although virtual currency has a resemblance to both traditional cash and commodities, it has some unique features and the other risk profile that may not have been taken into the previous rules. This is due to the fact that virtual currency trading is largely active in most countries without any special rules or legal supervision.

Among the main regularities in the financial stage related to the new phase of development of global economy, the development of financial innovation processes, which was studied by Ukrainian and foreign scientists, should be noted: E. Androulaki, S. Kapkun, O. Karame, M. Roeschlin, T. Scherer (Androulaki et al., 2013; Gervais et al., 2015), M. Andruchowicz (Andrychowicz et al., 2014), D.M. Hrazhek, N. Kourtois (Courtois et al., 2014), G. Maxwell (Maxwell, 2013), A. Gervais (Gervais et al., 2015), O. Halytsky, O. Moroz, E. Molchanova, Y. Solodkovsky and many others.

Despite the economic and social perception of cryptocurrency, the legal basis for its issue, circulation, and use has not been established yet in many countries. The National Bank of Ukraine noted that cryptocurrency owners "must be aware that they conduct transactions with it at their own risk." Although state recognition of high probability of fraud, cyberattacks, lack of guarantees, in fact no legislative or preventative measures (except for a few preventions about the dangers) were taken. Instead, the status and regulatory bodies of cryptocurrency have been officially identified in highly developed countries.

1. The current state of the cryptocurrency market

According to analysts, the cryptocurrency market is profitable for large companies as the possession of significant capital in different countries of the world, which is not linked to local currencies, causes the interest of the virtual money market [[1]].

The cryptocurrency market during 2019 was split as follows: China - 60%, the USA and Canada - 16%, Georgia - 6%, Europe - 5%, Iceland - 4%, India - 3%, Russia - 2%, Australia - 2%, South America

[1] Exchange for virtual currency has found investors. Retrieved from http://www.vedomosti.ru/tech/news/11932001/5_mln_za_virtualnuyu_valyutu

- 2%. Digital exchange of cryptocurrency is carried out on such world exchanges as “Bitfinex”, “Poloniex”, “Kraken”, “Shapeshift”, “Changelly”, CHBTC, “Bitsquare”, “Bittrex”, “BitMEX”, BTER, “Yobit”, “CoinExchange”, “LiteBit”, “Btc Markets” etc. [2]

As of February 2020, the total number of cryptocurrencies had 1,112 titles. At the same time, the top five market leaders show the increase of capitalization at least USD 253 million per day (Table 1) [3].

Table 1. Capitalization of cryptocurrency as of February 2020

№	Currency	Capitalization, USD	Price, USD	Volume, USD
1	Bitcoin (BTC)	60 029 341 962	3 425,28	1 261 204 342
2	Ripple XRP	12 165 424 283	0,30	141 215 377
3	Ethereum ETH	10 947 799 823	104,50	638 892 278
4	EOS	2 121 033 969	2,34	230 233 178
5	Tether USDT	2 069 220 178	1,02	946 339 017
6	Bitcoin Cash BCH	2 144 276 404	121,77	79 502 037
7	Litecoin LTC	2 002 547 136	33,17	158 265 106
8	TRON TRX	1 728 407 725	0,0259	51 637 100
9	Stellar Lumens XLM	1 430 158 443	0,07	43 757 318
10	Binance Coin BNB	1 120 313 983	7,94	68 904 79

*Systematized on basis [4]

At the beginning of 2017, the total capitalization of all cryptocurrencies amounted to about USD 18 billion. In December 2017, the cryptocurrency market capitalization crossed mark of USD 500 billion. However, as of 01.10.2018, it has decreased to USD 453 billion. [5].

Analyzing the dynamics of cryptocurrency prices in recent years, we can notice that this is a classic "pyramid". Whereas a document from the UK Government titled “Digital Currencies: Responding to Information Request” states that the use of digital currencies has minimal risks to the financial stability and monetary system of the country.

The development of IT technologies and cashless payment infrastructure has led to fundamental changes in the mechanism of monetary issues. Thus signs of official recognition of cryptocurrency by the financial establishment are gradually emerging. The largest investment banks (“Goldman Sachs”, “Merrill Lynch”, “Bank of America”) issue reviews of the prospects of various cryptocurrency, indicating that they are practically "fit" in the traditional financial system. Six major international banks (“Barclays”, “Credit Suisse”, “Canadian Imperial Bank of Commerce”, HSBC, MUFG and “State Street”) have organized a project to create a new cryptocurrency – “utility settlement coin” (USC). After joining to the project “Deutsche Bank”, “Banco Santander”, “BNY Mellon” and NEX, it has got to a new level that involves discussing this idea with the Central banks, as well as improving the data privacy and defending of cyberattack system [6].

Online stores take up for 31% (16 companies) of all Ukrainian companies (52 companies) that have accepted cryptocurrency. It should be noted that the introduction of cryptocurrency for making payments increases the speed of payment [7].

The most common method of creating a cryptocurrency is mining, which is done at the expense of the computing power of computer hardware [8].

The goal of the technique is to select from the millions of combinations one correct hash code that will form the block header in the blockchain. As soon as the required number is generated, the block

[2] Bitcoin and other cryptocurrency: risks and prospects for using in Ukraine. Retrieved from http://www.niss.gov.ua

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[5] Carnes B. Ukraine is silently leading a digital currency revolution. Ben Carnes. Official site Forbes. 2017. Retrieved from https://www.forbes.com/sites/realspin/2017/03/20/ukraine-is-silently-leading-a-digital-currencyrevolution/#4d0ef946465.

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with all transactions has closed and the miners proceed to search for the next one. For the right hash code, miners are rewarded with 12.5 bitcoins.

In addition to mining, there are many other ways to earn cryptocurrency. The main of them are:

1. Cranes - services for the distribution of Bitcoin and other coins for doing small tasks: captcha solving, web surfing, etc.

2. Bounty - the process of advertising new ICO projects using posting, reposting, translations. At first, you receive tokens for free that will soon become a full-fledged cryptocurrency.

3. Posting / Copywriting - Steemit and Golos members receive rewards in the form of internal cryptocurrency. Later they are exchanged on the exchanges.

Bitcoin and other coins can be easily purchased on the exchanges, exchangers, cryptomats or even directly. You need to create a wallet to start using cryptocurrency [9].

Attitudes to cryptocurrency differ significantly from country to country. Singapore, Spain, Germany, Australia, the Netherlands, New Zealand stimulate their turnover in every way. The Federal Office of financial control in Germany does not consider Bitcoin as electronic or fiat money. Instead, it refers them to the categories "private money" and "financial instrument". Cryptocurrency activity requires special permission. Increased requirements have been established: the existence of a business plan, professionally-qualified staff, permanent reporting, and the requirements for authorized capital. Spain recognized Bitcoin as the official payment system in 2014. In Cyprus, cryptocurrency can be paid for university. Digital salaries are allowed in Canada. As a result, mining cryptocurrency is subject to income tax. Bitcoin has been officially recognized as a payment instrument in Japan since April 2017 [10].

China, Russia, Indonesia have significant restrictions for cryptocurrency, even though cryptocurrency are allowed in grocery stores in Indonesia. Direct prohibitions for cryptocurrency are currently set only in Bolivia, Ecuador, Thailand, and Vietnam. The majority of governments have chosen a position of neutrality, avoiding specific decisions. However, the neutral attitude of most countries to cryptocurrency applies only to "private" currencies [11].

The cryptocurrency market in Ukraine is in a legal vacuum. Nowadays the most important problem for Ukraine is the mechanism of implementation of the concept of cryptocurrency in national legislation via adoption of relevant rules in the sphere of tax, banking, civil and commercial law. More and more Ukrainian consumers are using cryptocurrency to buy goods and services online or use it as high-cap investments [12].

Factors for successful functioning of cryptocurrency in national markets for countries with a standby position:

1. Introduction of state-of-the-art information technology with participation of the state, large corporations and venture capital funds;

2. Implementation of an official legal status of a cryptocurrency and creation of a legal trading platform for its circulation;

3. Development of cryptocurrency circulation rules that will provide it as a competitive means of payment;

4. Development and implementation of accounting and tax characteristics for cryptocurrency;

5. Creating an open ecosystem using effective interaction of all participants (investors, miners, users, purse suppliers, exchanges, trading platforms, etc.);

6. Providing information support to increase public confidence in virtual currency.

2. Advantages and disadvantages of using cryptocurrency in the financial system

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[10] Bitcoin is the currency of the future. Retrieved from https://media.slovoidilo.ua/media/infographics/4/33161/33161-1_ru_origin.png

[11] Bitcoin and other cryptocurrency: risks and prospects for using in Ukraine. Retrieved from http://www.niss.gov.ua

[12] Makarchuk I.M, Perchuk O.V. & Malyshko, V.V. Prospects for using cryptocurrencies in modern economic systems. *Journal IGTU*. 2019. Vol. 2 (88), pp. 179 - 185. DOI: https://doi.org/10.26642/jen-2019-2(88)-179-185

The current state of the cryptonmarket makes it possible to analyze the strengths, weaknesses, opportunities, and associated risks. To clarify the main characteristics of cryptocurrency we need to define their strengths and weaknesses in the example of Bitcoin [13].

Strengths:

- preventing inflation through the limited number of available BTC. Bitcoin was created to become a viable currency in limited numbers. There will be only 21 million Bitcoins, but the cryptocurrency has units called Satoshi, which stand at 0.00000001 BTC. This creates a "safe harbor" for investors' funds as they will never be affected by inflation;
- it does not generate exchange fees and can be used internationally. Most currencies are only accepted in certain countries or regions. This includes exchange transactions that generate commissions - waste of money. Bitcoin can be purchased in minutes or even instantly. It can also be stored in mobile, online or physical digital wallets. After being transmitted to the digital wallet, Bitcoin can be used for purchases from thousands of suppliers worldwide;
- financial services for persons with low access to banking systems. Cryptocurrency are uniquely positioned as the technology predecessor that will transform financial systems. By its nature, Bitcoin is able to fill the gaps in current financial technology and can help solve traditional banking problems by being a peer-to-peer system [14].

Weakness:

- a dubious reputation. Initially, Bitcoin formed a dubious reputation. Incidents such as “The Silk Road” can create a negative image of all cryptocurrency, not just Bitcoin. “The Silk Road” was an online shop on the Darknet market that allowed drug trafficking to nearly millions of customers. It was disbanded in 2013, and cryptocurrency has been able to restore the reputation. In fact, the transparency offered by blockchain means that cryptocurrency transactions are easily tracked, so they are a drawback to criminal activity;
- vulnerability to hacking attacks. Blockchain means that the transaction log is used by all users. Therefore, it is easily attacked. So far Bitcoin network has suffered several "stress tests" that were essentially hacking attacks. These "tests" were launched by exchanges and swindlers to try to demonstrate the weakness of the Bitcoin design. The network still cannot process too many transactions;
- Blockchain is public and transactions cannot be canceled. A public registry or blockchain based on cryptocurrency means that every user can see every transaction. There is semi-anonymity because the owners of bitcoin wallets cannot be identified directly, but still there are tracking methods [15].

Features:

- independence from centralization. Cryptocurrency is the dream of any liberal. Since there is no central government, the market balances automatically and develops naturally;
- fast international operations. Companies are beginning to understand the value of using cryptocurrency for international transactions, especially when transactions must be made quickly. Bitcoin is positioned to solve this problem because of the speed and convenience of the transaction;
- gold-like value storage. One of the greatest features of Bitcoin is that it can act as a kind of gold-like commodity. The value of gold increases significantly each time when an event threatens global market equilibrium.

Risks:

- security risks. As Bitcoin grew, there were people who used high technology to compromise cryptocurrency management. From the sharing platforms that have been hacked, and to the theft of individual wallets, incidents have become quite numerous. Unfortunately, this is one of the drawbacks of any digital system. Both users and companies need effective security measures;

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[13] Y.B. Kim, J.G. Kim, W. Kim, J.H. Im, T.H. Kim, S.J. Kang. Predicting Fluctuationsin Cryptocurrency Transactions Based on User Comments and Replies. *PLoSONE*. 2016. Vol. 11. № 8: e0161197. DOI: https://doi.org/10.1371/journal.pone.0161197

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- low scalability. Although the technology is constantly evolving, Bitcoin is currently unable to process a large number of transactions. New projects like the Lightning Network, that allow you to handle large payments, are just getting started. Developers need to devote a lot of time and effort to change this situation;

- unclear legal status. There are threats from the regulators for the crypto-market in general. Like that the Internet is censored in some parts of the world. The cryptocurrency faced with the pressure regulation when it threatens local currencies and governments. For example, China tried to limit the circulation of cryptocurrency with limited success. It does not mean that they can stop or control, but it can prevent connection with traditional banking systems;

- increased volatility. It is known that the price of Bitcoin can fluctuate dramatically without any justifiable reasons. This allows us to consider Bitcoin as assets with high risk factor compared to conventional assets. For example, its price was above USD 1,500 at the beginning of 2017 and in December 2017 inflation reached a record level of $ 20,000. Today it is trading at above USD 3700. But sometimes, even daily fluctuations have achieved double digit percent.

3. The prospects of further functioning of the cryptocurrency in payment systems

The described features of the functioning of cryptocurrency, its issue and the purchasing are significantly different from the features of the functioning of fiat currencies. In 2018 the world market capitalization of cryptocurrency amounted to USD 538,4 billion, with 80% of this amount is for the top ten rankings of digital currencies such as Bitcoin, Cash Bitcoin, Ethereum, Ripple, EOS, Litecoin, Stellar lumens, Neo, Dash and TRON. However, like any other new phenomenon, cryptocurrency overcomes a lot of doubts, such as loss of password or access to the electronic wallet, the possibility of hacker attacks, inability to contribute to the authorized capital of legal entities. Despite this fact, the Ukrainian it professionals continue to invest in this currency. Today Ukraine takes the 5th place by number of users bitcoin wallets among different countries [16].

According to Dr. Garrick Heilman, cryptocurrency is becoming an increasingly important part of society and technology work around the world. Thus, according to the study, the number of people using cryptocurrency has increased and is approaching to the population of a small country - from 2.9 to 5.8 million people. Most are residents of North America and Europe.

The list of common cryptocurrency and their exchange rate is given in table. 2 [17].

Table 2. Cryptocurrency exchange rate

Cryptocurrency	01.01.2016 (USD)	01.01.2017 (USD)	01.01.2018 (USD)	01.01.2019 (USD)
PIVX	0,0032	1,22	10,36	0,86
NEM XEM	0,001878	0,223566	1,58	0,06
Siacoin SC	0,000325	0,004368	0,032	0,00
Dash DASH	8,18	98,4	1 108,93	79,69
Litecoin LTC	4,72	27,23	247,36	31,63
Etherium ETH	13,48	124,1	748,52	139,71
Bitcoin BTC	440,53	965,77	14 384,385	3765,49
Byteball Bytes GBYTE	-	89,458	707,55	28,89
Decred DCR	0,108	0,485	113,015	17,24

*Systematized on basis [18]

The most widespread cryptocurrency in the world is Bitcoin, which continues to develop. The number of users of this system is steadily increasing in Ukraine. Popularity of Bitcoin has also generated the creation of other cryptocurrency that are1 developing nearby Bitcoin, but their popularity and

[16] The official site of Bitcoin. Retrieved from https://www.bitcoin.com/info/bitcoin-glossary.
[17] Cryptocurrency exchange rate. Retrieved from https://minfin.com.ua/currency/crypto/2019-01
[18] Cryptocurrency exchange rate. Retrieved from https://minfin.com.ua/currency/crypto/2019-01-01/

capabilities are much less. In some countries, including Ukraine, the authorities began to struggle with Bitcoin, warning people against investing in "money surrogates" and possible loss of it if Bitcoin collapsed. However, such a confrontation is caused by the desire to concentrate the functions of monetary emission. Therefore, the authorities prevent the creation of alternative sources of payment issues, since they are not regulated by the state [19].

The Ukrainian Stock Exchange has started trading futures contracts on the Bitcoin index since December 2017. The contract specification is registered with the NSASMC. It is the first regulated market in the world that offer Bitcoin futures. In 2016 Axon Partners became the first Ukrainian company to contribute Bitcoin into its authorized capital, indicating that cryptocurrency is using in Ukraine [20; 21; 22].

This tool requires, first of all, the legal recognition by the world governments and the granting of the official status as the means of payment and the elaboration of the legal framework (development of formal rules and regulations) for the issue, circulation, identification of users and payments. In the process of globalization of electronic payments, users are increasingly recognizing convenience and efficiency of cryptocurrency.

For the effective functioning of cryptocurrency they need to be institutionalized. There are two ways to do this: at first, it is legal institutionalization, and secondly, the market institutionalization, which is due to the formal and informal establishment of rules for the functioning of cryptocurrency.

It should be noted that the positioning of cryptocurrency in the international payments market depends on which approach in regulating transactions with this currency is chosen by national governments.

Countries with a loyal position to cryptocurrency using financial regulators tax, license and restrict payments with that currency.

The USA uses two approaches for taxing Bitcoin operations:

1) taxation of the capital asset (long-term investments) at the rate of 15% of the received income and short-term investments at the rate of 35%;

2) taxation of currency transactions at a rate of 23%.

Denmark and Japan regulate the activities of exchanges that trade in digital currency. In Germany cryptocurrency transactions are licensed, Bitcoin payments are allowed along the country [23]. Bitcoin operations are officially authorized in several countries. They are usually regarded as a commodity or investment asset and they are subject to the relevant legislation for tax purposes. In some countries (Germany, Japan) Bitcoin is recognized as a currency [24].

Countries with a categorical position prohibit any cryptocurrency transactions and consider it as a threat to the stability of the national financial system. Thus, according to the Central Bank of Bolivia, the currency that is neither issued nor controlled by the government is illegal.

Countries with an expectation position warn their citizens against using cryptocurrency due to its riskiness and speculative nature, but do not prohibit transactions with it.

It is quite obvious that countries should use the liquid potential of cryptocurrency for the development of national economies. Most developed countries are adapting their legislation to regulate the virtual currency, which will gradually adapt the innovations of the financial market - cryptocurrency to modern realities. The time has come to create a functional, transparent, cheap, publicly accessible,

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[19] Joint statement by financial regulators about the status of cryptocurrency in Ukraine. Retrieved from https://bank.gov.ua/control/uk/publish/article?art

[20] Petruk O.M., Novak O.S. The essence of cryptocurrency as a methodological background of its accounting display. *Bulletin ZSTU*. 2017. № 4 (82). P. 48-55

[21] Carnes B. Ukraine is silently leading a digital currency revolution. Ben Carnes. Official site Forbes. 2017. Retrieved from https://www.forbes.com/sites/realspin/2017/03/20/ukraine-is-silently-leading-a-digital-currencyrevolution/#4d0ef946465.

[22] Ciaian P., Ciaian P., Rajcaniova M., Kancs d'Artis. The economics of BitCoin price formation. *Applied Economics*. 2016. Vol. 48 Iss. 19. DOI: https://doi.org/10.1080/00036846.2015.1109038

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unifying the whole world the monetary instrument. The state should make every effort to provide legal and technical support for the operation with this financial market instrument for maximum benefit. [25]

Conclusions

We believe that in developing of appropriate regulation and infrastructure, cryptocurrency system will occupy a niche in the payment system of Ukraine. In the first stage, this system is used in the field of information services, but every year it gets into the sphere of consumer services.

Blockchain technology in Ukraine in the future can be actively used not only for IT technologies and cybersecurity, but also for data storage in the real estate trade and property registration, cadastral accounting, government, banking, education, medicine, trade, insurance, ect. So blockchain technology is self-sufficient, secure, decentralized, reliable and cheap.

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