

Blockchain as the Component of the Macro-Generating Cluster of the Sixth Technological Mode

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Abstract

The modern economic system is characterized by the successive replacement of the Fifth Technological mode by the Sixth Technological mode. The specificity of the Sixth technological mode is the predominance of system-integrating and macrogenerating clusters in its structure. The dominant cluster is the supercluster of telecommunications and digital technologies. Blockchain is a component of this supercluster. Blockchain is a technology with a special mechanism of diffusion into existing economic systems, which can be described in terms of actor-network theory. The corresponding diffusion mechanism includes the following elements: (1) making the new technology obvious, (2) creating a contrast between the complexity and volumes of the preliminary research and the simplicity of the proposed technology, (3) achieving credibility through the simplicity and visualization of the technology, (4) ensuring inequality of opportunities between those who are supporters of the technology and its opponents, (5) a high level of trust in the creator of the technology, (6) the creation of an actor-network structure around the technology. The paper analyses the data components in relation to blockchain technology.

Keywords: blockchain, technological mode, macrogenerating cluster, actor-network theory, cryptocurrency, evolutionary economics, INT (STS)

I. INTRODUCTION

The theory of economic disequilibrium states that disequilibrium processes in the economic system are normal, while economic equilibrium should be considered a local and time-limited state. However, economic science continues to adhere to the paradigm of equilibrium, despite the fact that the theory of general economic equilibrium does not agree with empirical data for a number of factors [1] and does not satisfactorily model such large-scale changes as the change of technological modes, the birth, development and fading of industries, and dissipation of new technologies [2, 3].

Events of recent decades in the global economy demonstrate an increasing discrepancy between traditional economic paradigms, models, and approaches to the real processes that are developing in it. Moreover, new technologies emerging within the framework of the Sixth Technological mode are rejected by the existing financial and economic structures: they are considered as a threat to their current state.

Under these conditions, a transition to more adequate socio-economic disequilibrium models is necessary.

II. METHODS

The main point of the economic disequilibrium theory is that disequilibrium processes are a normal state of the economic system, and the equilibrium state is reached for a short period of time and is not decisive for the overall development of an economic system.

Demand and supply in this case not only does not depend on prices, as it is postulated in the framework of the general economic equilibrium theory, but, on the contrary,

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determines their dynamics. The driving force behind demand is the “objective inclination of people to change the types of goods consumed” [4, p. 47]. As a result, demand or necessity is constantly generated along with solvent demand in the economic system, which forces entrepreneurs to constantly develop new types of goods more and more.

Technologically homogeneous aggregates of such goods form macrogenerations that have the property of being born, developed, and dying, competing with each other for resources. At the heart of each new macrogeneration is a cluster of innovations that conquer the market by offering new products, technologies and forms of organization of production. Combinations of such macrogenerations form technological modes. According to their definition, technological modes are “holistic production and

technological systems, including technological processes of the corresponding type of economic activity with industry orientation, as well as elements of a subsystem of various complexes integrated (joined) into intersectoral clusters” [5, p. 28]. Currently, there are six technological modes that have succeeded each other from 1760 to 2020.

At the stage of the Sixth technological mode, inter-industry clusters are replaced by system-integrating clusters that serve not individual industries, but the entire system.

The specific demand from consumers inclined to exert new needs acts as the main driving force that determines the birth of new macrogenerations. A phase image of the development of a macrogeneration from its birth to its disappearing can be represented as follows. (Fig. 1) [4]

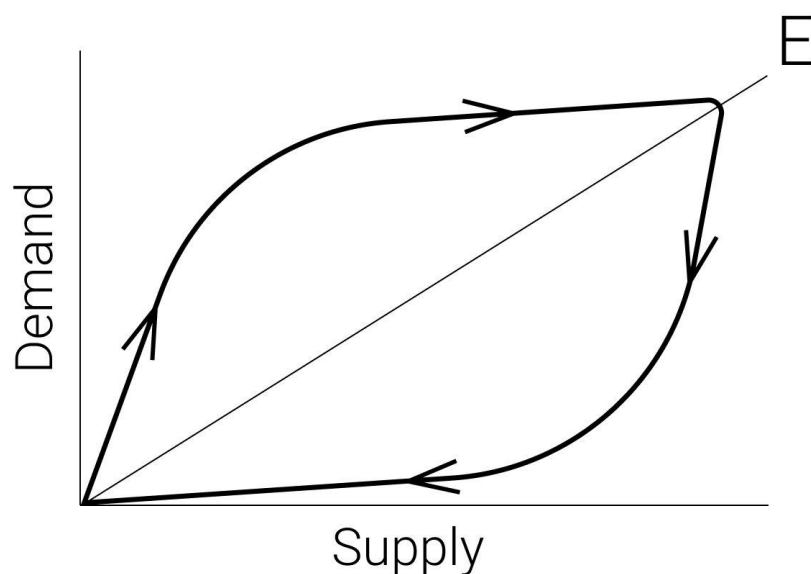


Рис.1

In relation to the traditional representation of supply and demand within the framework of the general economic balance, two phases of the disequilibrium of supply and demand for macrogeneration products can be distinguished:

- (1) The recovery phase, when demand for new products significantly outstrips supply, which leads to a high price level requiring additional injection of money into the economy, which inevitably leads to inflation;
- (2) The degradation phase, when, after a short-term equilibrium of supply and demand (point E), the stage of lowering demand below supply begins, which pushes prices for macrogeneration products down.

Similar characteristic loops of changes in the observed values in a phase space and their ambiguity, since two fixed positions on the axes correspond to two positions on the graph, is called hysteresis (from the Greek word “Hysteresis” which means “delay”) [6,7].

The birth of new macrogenerations within the framework of an evolutionary economy is mainly due to demand, or

necessity, which, in our opinion, cannot be considered satisfactory. Within the framework of this model, there is not taken into account the factor determining the progress of science and technology, which development laws can significantly complement and clarify it.

III. RESULTS AND DISCUSSION

The emergence of blockchain technology should be attributed to the period of the 5th technological mode, within the boundaries of which the system cluster “telecommunications and digital technologies, software and its design, creation, maintenance of the global Internet and other global networks, and the services that these networks provide: mobile telephone communication, digital television, microelectronics” [8, p. 37]. A feature of this cluster is its transformation from industry to system, which is generally characteristic of technological clusters in the transition from an industrial to a post-industrial economy. The consistency of technological clusters is defined as the universality of the technologies generated in their core,

which are spread and applied in all macroeconomic generations that make up this technological mode. The trunk-axial structure of a technological cluster continues to

exist at the core of the 6th technological mode as a system cluster of superfast digital telecommunications, etc. (see table 1)

Table. 1. The main axial structure of information technology

Technological mode	Intersectoral, systemic clusters that determine macroeconomic generation	Cluster content	The development of electronic money / cryptocurrency technology *
Third (from 1870-1880 to 1920-1930)	9	Cluster of telegraph (wireless), telephone, and radio communications, sound recording and sound reproduction	The emergence of single-purpose prepaid and gift cards of trade organizations
Fourth (from 1920-1930 to 1970-1980)	9' 15	Cluster of telephone, radio and television communications, their element base, digital and analogue electronic computers and systems	Transfer of records in bank accounts from paper to electronic form
Fifth (from 1970-1980 to 2015-2020)	9'' 15' 17	System cluster "telecommunications and digital technologies - computer information technologies, software - design, creation, maintenance of the global Internet, other global networks, as well as the services that these networks provide - mobile telephony - digital television - microelectronics"	Embedding a microchip in cards issued by banks, allowing for offline and anonymous payments for purchases. The advent of blockchain technology and cryptocurrencies.
Sixth (from 2015-2020 to 2045-2050)	9''' 15'' 17' 24	System cluster of superfast digital telecommunications, quantum teleportation information technology, nanoelectronics, global information and intelligent networks.	The emergence of blockchain 2.0, "smart" contracts, tokens, cryptocurrency exchanges, ICOs

*Source: [8], developed by the authors

A feature of the blockchain is the high role of the social factor in the dissemination of this technology, despite the fact that in modern conditions the achievement of a market niche by an innovative product is associated with significant investments in the development of technological innovations, marketing, and advertising. Blockchain and its associated technology for issuing cryptocurrency Bitcoin initially violates prevailing distribution strategies: its inventor S. Nakamoto [9] provided its development for

public use and did not make any efforts for its distribution or patent protection.

According to our hypothesis, the diffusion of constituent technologies of system-integrating clusters occurs in the process of their developing according to the model for the dissemination of scientific knowledge developed by B. La Tour [10]. Table 2 presents the constituent models developed by B. La Tour in comparison with the stages of development of blockchain technology.

Table 2

Social diffusion of scientific ideas according to B. La Tour	Blockchain technology development stages
Making the statement obvious	The publication by S.Nakamoto of a manifesto on blockchain technology and cryptocurrency
The contrast between the size of the investigated problems and the simplicity of the proposed solutions	An alternative to a complex system of fiat money and credit; crypto protection with a single blockchain technology
Achieving persuasiveness through simplicity of	Blockchain as a distributed database with open access for all participants

judgment. Visualization of the phenomenon	and the ability to track all transactions
Inequality of opportunities for those who defend a scientific statement and those who will challenge it	The rapid growth in number of blockchain and cryptocurrency users. The emergence of various cryptocurrencies. Blockchain and cryptocurrencies as tools for saving money in a financial crisis
High level of trust in the author of the statement	Blockchain technology is open to all. Anonymity of S. Nakamoto and his rejection of patent protection for the technology. A high level of trust between participants in the blockchain platform.
Rhetoric of the text. References to a large number of references. Network creation.	Blockchain fully embodies the idea of a network of actors according to B. La Tour, which includes non-people along with people, i.e. components of technological nature

Let's consider each element of the table in more detail.

(a) The birth of blockchain technology has occurred since the publication by S.Nakamoto of the file with a description of the protocol and the principle of its operation, as applied to the payment system. As the further development of the blockchain has shown, its applicability is much wider than just a decentralized (peer-to-peer) payment system. The technology came into public use, and its author or authors have never claimed patent protection.

(b) As M. Anderssen notes in his article “Why Bitcoin is so Important?” [11], blockchain is the result of more than 20 years of research in the field of cryptographic currencies and 40 years in the field of cryptography. The first developments in electronic money were made back in 1983 by D. Chaum and S. Brandis; in 1997 a system of protection against spam and cyber-attacks was proposed, which was then developed in the form of the blockchain and in 1998 cryptocurrency

ideas were proposed: b-money (Wei Dai) and bit-gold (N. Szabo). Thus, the blockchain synthesized these and many other developments, thereby offering a relatively simple solution to a rather complex conglomerate of multidirectional studies.

(c) The credibility of blockchain technology is achieved through the distribution of the entire database of transactions. The blockchain is a peer-to-peer network, that is, there is no hierarchy in it: all network participants have the same access to the database, in which all transactions carried out between the participants are recorded. At the same time, no member or group can change the information in any information blockchain block.

(d) To date, the blockchain penetrates widely into all sectors of the economy, finance and credit. The volume of exchange trading in cryptocurrency exceeded 198.6 billion US dollars (see Fig. 2). The blockchain is used in finance, archiving, storing large amounts of data, education, e-government, and energy [13].

Total Market Capitalization

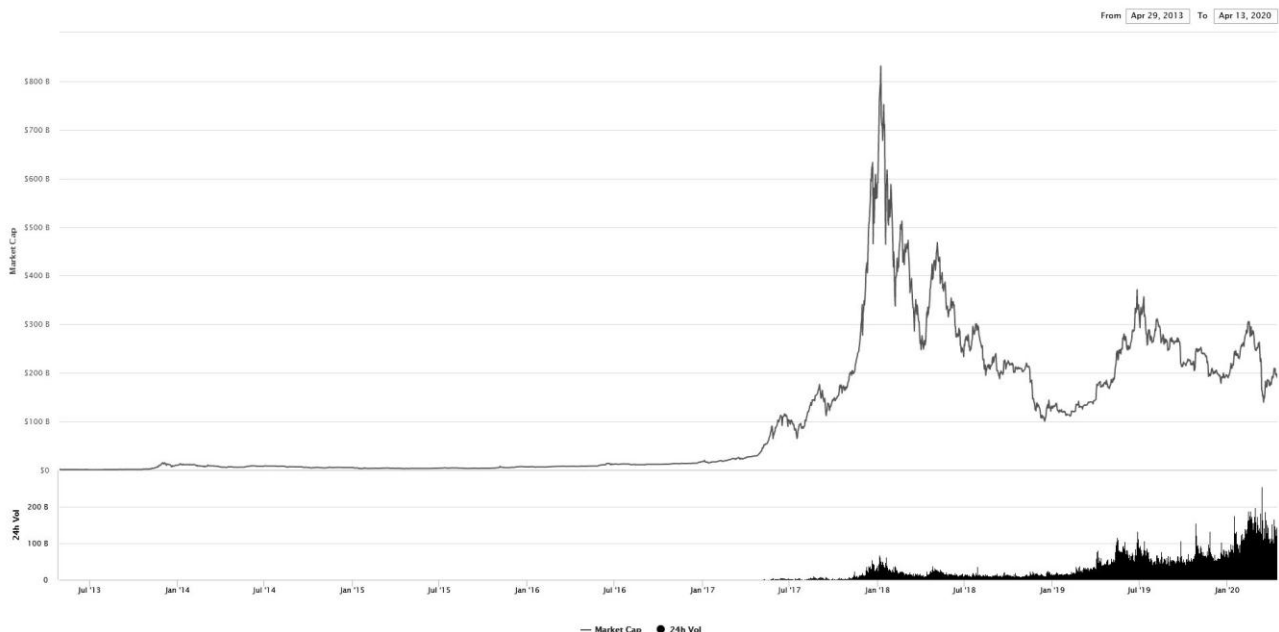


Fig. 2. Cryptocurrency Market Capitalization Dynamics

Since blockchain is a system-integrating technology, this significantly outweighs the capabilities of opponents of its distribution or even prohibition. Those countries that objected to the legalization of the blockchain, because they saw in this technology a threat to the national monetary system, are inclined to allow its use. An example of this is

the decision of the Central Bank of Russia to test the exchange of ABC tokens of the Norilsknickel Corporation [13]. The number of countries legalizing virtual currencies exceeds 120 [14] (see Fig. 3)

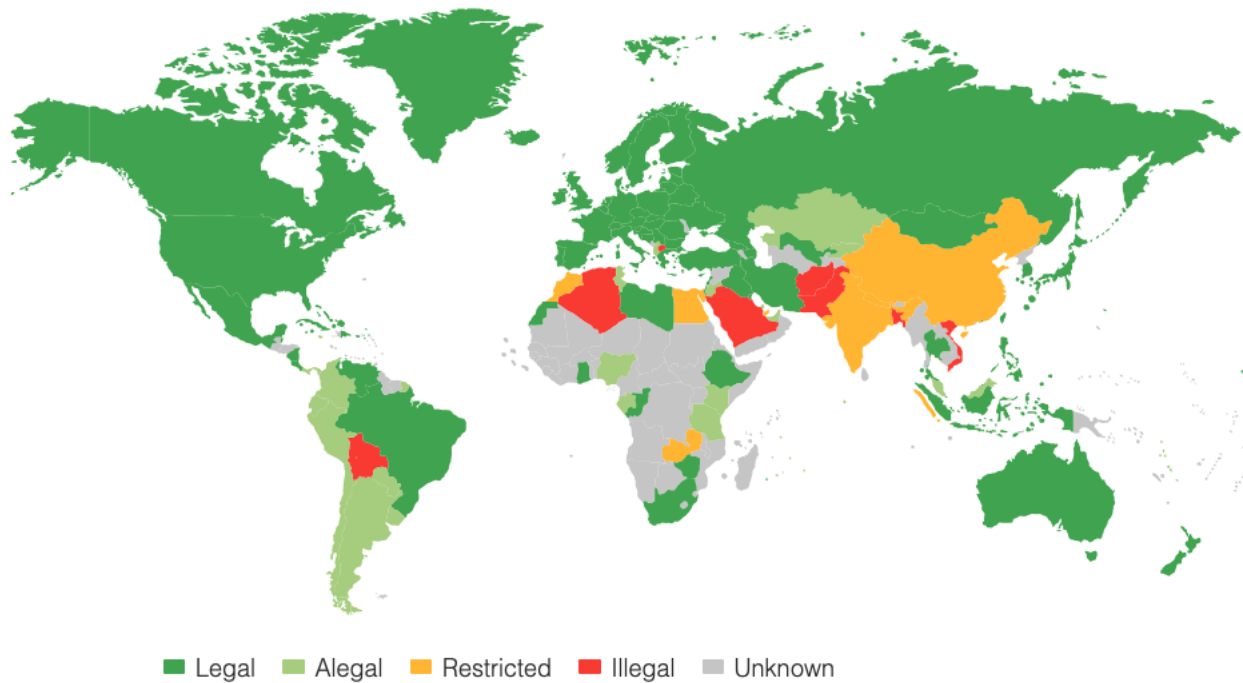


Fig.3. Bitcoin Legality by Countries, URL: <https://coin.dance/poli/legality>

(e) Trust in blockchain technology is determined by its openness, decentralization, and freedom of use. [15] Blockchain underlies the creation of cryptocurrencies, tokens, smart contracts, and so far, cases where this technology has detected vulnerabilities such as “double spending” and “51 per cent attack” remain very rare. [16, p.256]

(f) In order to ensure a high level of trust in the author of a scientific text, special rhetorical techniques are used, for example, reinforcing statements with references to already published and respected studies, researchers and scientists in this field. In B. La Tour's terminology, this means the formation of a network of actors. [17] It is convenient to consider the blockchain from the perspective of this approach, the central thesis of which is to include both people and non-people in the network nodes, in this case the existing blockchain infrastructure: cryptocurrencies, mining farms, crypto-exchanges, smart contracts, tokens etc. Currently, due to the spread of the scope of application of the blockchain, this network of actors is actively expanding.

IV. SUMMARY

An analysis of the current state of blockchain technology and related cryptocurrencies allows us to predict that its

“diffusion” will continue not being limited to those sectors of the economy and social sphere in which they are currently used.

Currently, the issue of the future global financial system is being actively debated. Cryptocurrencies are considered as one of the possible models of the new world currency, which is devoid of many of the drawbacks inherent in fiat money systems, in particular, the impossibility of uncontrolled emission. A number of researchers believe cryptocurrencies are a natural evolution of centralized monetary systems into decentralized ones [16]. Based on the model of B. La Tour, we can expect that the adoption of a decision will occur according to the described scheme of technological “diffusion”.

V. CONCLUSIONS

The global financial crisis actualizes the search for a new paradigm of economic theory. The paradigm of general economic equilibrium does not allow us to adequately describe the processes taking place in the world economy, but also to offer effective tools to overcome them.

An analysis of the distribution of blockchain as a system-integrating technology of the Sixth Technological mode allows us to differently assess the role of disequilibrium

processes in the economic system. That is defined as destructiveness from the point of view of economic equilibrium, acts in the paradigm of economic disequilibrium as the formation of new types of structures, and the transition of the economic system to a new level of complexity.

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