

Development of Innovation Systems in Bioinformatics Using Blockchain Platforms

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ABSTRACT

It is reasonable to use digital technologies to organize and support an innovation system that simplifies and promotes interactions between innovation activity participants by performing a situational analysis of big volumes of structured and unstructured data on innovation activity subjects in the regions. The aim of the article is to substantiate the essence, peculiarities, and features of integrating blockchain platforms with big data intelligent analytics for regional innovation development. The study was carried out as based on materials describing the development of this concept both in the whole world and its spread in the Russian economy.

KEYWORDS

Big Data, Blockchain Platforms, Cyber-Social System, Innovation System, Intellectual Analysis, Multi-Agent Approach

INTRODUCTION

Today we can observe the strengthening of global communication accessibility that promotes the emergence of new economic relations on the principles of collaborative behavior.

The authors in previous research identified that the main barrier impeding efficient interaction of innovation actors in Russian Federation (RF) is high level of transaction costs. As a rule, there are growing instability and uncertainty of existing links and relationships at innovation activity stages, which, in particular, stimulate the growth of transaction costs. This determines high costs of development and implementation of innovations. Such costs are not of transformational nature associated with transformations and changes of initial resources, but of transactional one that is determined by a necessity of collaborations and mutually beneficial contacts.

The strengthening of interactions between interested participants in a regional system appears to be an important mechanism of innovation activity development from the emergence of an idea to the commercialization of innovation.

It is reasonable to use digital technologies to organize and support an innovation system that simplify and promote interactions between innovation activity participants by performing a situational analysis of large volumes of structured and unstructured data on innovation activity subjects in the regions.

The cyber-social innovation system may be considered as an intelligent information system focused on lowering the barriers to implementation of innovations by engaging a larger amount of

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participants in the innovation process and ensuring their intensive interaction. Its synthesis requires a mechanism that will enable different agents of innovation interaction having common development goals to create new knowledge and exchange it in a safe intelligent network.

The Internet of Things (IoT), Big Data and blockchain are three main trends that could combine to create an entirely new methods and tools for managing regional innovation system and provide their economic development. Blockchain technology provides the ability to redistribute costs across all of the participants of the peer-to-peer network, and give each peer an economic motivation to provide their (small) part of the infrastructure needed to enable the greater good. This reduces the burden on any individual peer, while allowing them to leverage the resources of all (Sun, et al., 2015).

The aim of the present chapter is to substantiate the essence, peculiarities and features of integrating blockchain platforms with Big Data intelligent analytics for regional innovation development. The study was carried out based on materials describing the development of this concept both in the whole world and its spread in the Russian economy.

Background

The world experience in transition to the digital economy is disclosed in the works by Tapscott D. (1996), Brynjolfsson E. & Kahin B. (Eds.) (2003), Wetherbe J.C., Turban E., Leidner D.E. & McLean E.R. (2008).

Digital economy operates at three levels - markets and industries, platforms and technologies, environment (Bershinsky, et al, 2017). At the first level, suppliers and consumers interact, at the second level; competencies are formed for the development of markets and sectors of the economy. The third level is the environment that creates conditions for the development of platforms and technologies. Technological tools and management models are necessary for its successful operation and development. They will participate in all three levels, create “cross-cutting” technologies to operate in the global market and develop infrastructure for the digital economy (Mkrttchian, et al, 2016).

Many researches today are devoted to the investigation of the technologies and processes concerned with Industry 4.0 and its impact on economic development. Industry 4.0 supposes the use of network approach that is based on the ability of creating smart products and components (Kohlberg & Zühlke, 2015). According to the authors (Kohlberg & Zühlke, 2015) Industry 4.0 enables new implementation areas through the potential of Industry 4.0 technologies such as powerful, flexible and affordable Cyber Physical Systems’ applications with various production types.

The Internet of Things (IoT), Big Data and blockchain are three main trends that could combine to create an entirely new methods and tools for managing regional innovation system and provide their economic development. This development looks at the ‘art of the possible’ and this new way of thinking could provide powerful ways for a business to run autonomously (Sun, et al., 2015).

Blockchain technology provides an alternative that allows any single participant to essentially “outsource” the management, communications and scalable infrastructure problems to the peer-to-peer network that maintains the blockchain. Instead of using a central server, a distributed public ledger will be maintained to store the transaction records of “things” and every node will possess a copy of this immutable public ledger. The “scalability” feature of blockchain can be utilized to accommodate ‘things’ in the IoT world (Asharaf and Adarsh, 2017).

Blockchain is a specifically structured uninterrupted sequential chain of blocks (chained list, distributed register) containing information on participants and existing innovations (Swan, 2015). Copies of blockchains are stored and processed independently from each other in multiple network nodes (Franco, 2014; Antonopoulos, 2014). Originally the term referred to the completely replicated distributed data base (register) designed for the “Bitcoin” system, as the technology was initially intended for cryptocurrency transactions. Although blockchain can be applied to any interconnected information objects. Blockchain is actually a chain of blocks connected sequentially. In blockchains, the chronologically ordered data points are grouped into individual storage units called blocks. These

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