D. Bieliakov, Student
I. Zhalinska, PhD in Ec., As. Prof., research and language advisor
Zhytomyr Polytechnic State University

USING CUTTING-EDGE TECHNOLOGIES IN THE OIL AND GAS INDUSTRY

The aim of the study is to research the effectiveness of implementation of cutting-edge technologies into the oil and gas industry, particularly information technology and digitalization. The main directions of development of the industry and the benefits of using modern technologies are determined.

The oil and gas industry is going through transformational times, as reflected in the shale revolution, the gradual increase of the use of non-renewables, the recent drop in oil prices, and the increasing efficiency of energy use. With these changes, the industry is faced with several challenges in achieving its goals of efficient and environmentally responsible operations, production optimization, and capital cost reduction [1, p.1].

Obviously, global trends in the development of the oil and gas industry indicate the need for constant study of the market to adapt to internal and external changes and, accordingly, the effective functioning of oil and gas companies. In current economic conditions the qualitative complication of oil and gas development on numerous ways can be observed. It leads to higher costs and risks of participants in this process with increasing in competition in both domestic and foreign markets.

One of the areas of effective development of the oil and gas industry, which should be considered at the level of the entire industry, is to increase the technological level of enterprises and innovation. The implementation of modern information systems is one of the main vectors of current technological development of industry. Over the last few decades, companies in this sector have invested heavily in software development and new technologies to coordinate and analyze large amounts of data, identify optimal management and production pathways [2, p.20].

Using cutting-edge technologies and digitalization of the industry create opportunities to improve the environmental friendliness of the production cycle, their automation and optimization, reduce risks and costs, more efficient use of explored resources, increase safety and productivity.

In our view, it is appropriate to present the results of the global study of 2017 by Accenture and Microsoft, which, in particular, highlights the most important benefits of digitalization of oil and gas companies in the world. According to survey results, the higher speed of management decisions and their better quality were hold the first place; the second place – the acceleration of oil and gas production; and the third advantage is the reduction of business risk provided by real-time management decision support. The majority of respondents expects their companies to implement digital technologies in their activities, and 73 % of respondents indicate that most oil and gas fields will be fully automated using modern information technology within three to five years [4].

Digitalization leads in the priorities of research and development (R&D) for the oil and gas industry in 2019. Moreover, according to the DNV GL study, 60 % of respondents expect their organizations to increase spending in this area. The main

priorities in the digitalization program of the industry are primarily related to data exchange, integration and access to this data (cloud programs, data platforms and data exchange between organizations). Just over two thirds of respondents (67%) say that in the future their company will give priority to the quality and availability of data in 2019.

According to a 2017 report by the World Economic Forum, digitalization has the potential to create around USD1.6tn of value for oil and gas firms. This is not lost on industry leaders: approximately three-quarters (73 %) now say that their organizations need to embrace digitalization to increase profitability, compared to 49 % in 2017. Also 60 % of all respondents to survey report that their organizations are planning to increase investment in digitalization in 2019, up from 54 % that reported the same for 2018 (Fig. 1) [5, p. 30-31].

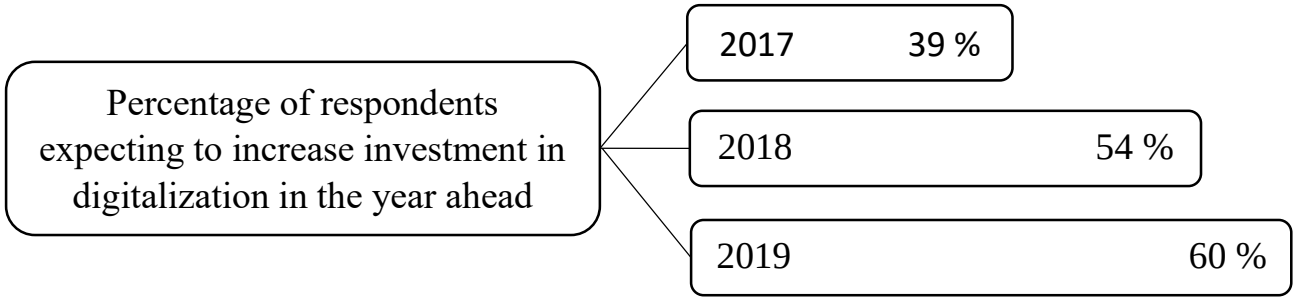

Fig. 1. Percentage of respondents expecting to increase investment in digitalization in the year ahead [5, p. 30-31]

These trends and changes in world industry, including the oil and gas industry, are due to the precondition of the gradual development of the fourth industrial revolution (Industry 4.0), characterized by the development and merger of automated production, data exchange and production technologies into a single self-regulatory system with the least (or completely absent) human intervention in the production process. Prerequisites for the development of the fourth industrial revolution are the introduction of advanced technologies in industry, namely: industrial Internet of Things (IIoT), cloud computing, artificial intelligence technology, complex information systems, the use of distributed registers – blockchain technology, smart contracts etc.

According to the concept of Industry 4.0, the oil and gas industry should include four key principles [6]:

– mutual coherence – joint activities of different production systems;

– virtualization – the ability of the cyberphysical system to observe physical processes;

– decentralization – planning and management of the production process without the intervention of the center;

– real-time mode – collection and analysis of production data in real time.

According to the reports issued by Deloitte in April 2017, the blockchain has great potential in the oil and gas industry mainly in the following four aspects: trading, management and decision making, supervision, and cyber security (Table 1) [7, p. 41432]. At the same time, global companies have already begun to invest in the development of this area, including British Petroleum and Shell.

Table 1

The main blockchain projects of the oil and gas industry in the world [7, p. 41432]

Continent	Location	Gas/Oil	Stage (Mid 2018)	Name/Company	Remark
Asia	Xiamen, China	Oil	Test	Sinochem Group	Simulated gasoline export from Quanzhou to Singapore
Asia	Abu Dhabi	Oil and gas	Test	ADNOC and IBM	Oil and gas production automation
North America	Houston	Gas	Test	S&P Global Platts	Platform for confirming transactions, reporting prices
Europe	London	Oil	Pre-launch	Vakt	Platform to cut post-trade cost
Europe		Gas	Pre-launch	OneOffice (BTL)	Platform to cut post-trade cost
Europe	Hamburg	Gas	Pre-launch	Enerchain	Platform for P2P wholesale trading
Asia	Fujairah	Oil	Live	FOIZ, S&P Global Platts	Oil terminal stock levels reporting
Africa		Oil	Test	Mercuria, ING, SocGen	Digital documents used for cargo traded three times on way to China
South America	Chile	Oil and Gas	Live	Energia Abierta	Regulator tracking national energy data
Europa	Britain, Italy, Austria	Oil and gas	Live	Interbit	Oil and gas trading
North America	America	Oil and gas	Live	PetroBLOQ	Oil and gas supply chain management
Europe	Switzerland	Oil and gas	Live	Komgo SA	Trading platform

In addition, the blockchain has significant potential for application in decision making. There are many problems in oil and gas exploration and development, related to the design, three-dimensional scanning of underground mineral data, as well as the design and maintenance of the necessary control and measuring devices. Nowadays, as a rule, months pass from the study of feasibility study to implementation. However, efficiency will be significantly improved if blockchain technology is used to virtually collect the necessary information in real time with its synchronization and coherence with different economic systems, for efficient processing, analysis and storage of data.

Blockchain permits the oil and gas industry the opportunity to reduce operating costs, speed up domestic operations and increase the reliability of their work. Prospects for the introduction of software products based on blockchain technology in the oil and gas industry are its application in the field of supply, maintenance of various types of registers, access to software products, combating DDOS attacks, distributed data storage, IIoT etc.

Currently, the use of blockchain in the oil and gas industry is still in the experimental stage. However, technology can provide many opportunities, such as improving the efficiency of management, reducing its costs, and increasing the transparency of the industry. However, the effective implementation of blockchain technologies at the level of the entire industry requires the regulation of law issues. In the future, the number of blockchain solutions in this area should increase, and the benefits of their implementation will increase significantly.

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