The European Proceedings of
Social & Behavioural Sciences
EpSBS

Future Academy

ISSN: 2357-1330

https://dx.doi.org/10.15405/epsbs.2019.03.122

GCPMED 2018
International Scientific Conference "Global Challenges and Prospects of the Modern Economic Development"

DEVELOPMENT OF BUSINESS ENVIRONMENT OF OIL AND GAS COMPANIES IN DIGITAL ECONOMY

D. R. Peskova (a)*, J. V. Khodkovskaya (b), V. S. Charikov (c), R. B. Sharafutdinov (d)
*Corresponding author

(a) Financial University under the Government of RF, Leningradsky Avenue, 49, 125993, Moscow, Russia, e-mail: DRPeskova@fa.ru
(b) Ufa State Petroleum Technical University, Kosmonavtov street, 450062, Ufa, Republic of Bashkortostan, Russia, e-mail: khodkovskiy@bk.ru
(c) Samara State University of Economics, Sovetskoi Armii Str., 141, 443090, Samara, Russia, e-mail: slava75c@mail.ru
(d) Ufa State Petroleum Technical University, Kosmonavtov street, 450062, Ufa, Republic of Bashkortostan, Russia, e-mail: rafinsky@bk.ru

Abstract

In Russia and in the world, the oil and gas industry is a driver of the economy, and its modernization in conditions of financial resources lack is important. One of the resources to save money is to increase the economic efficiency of oil and gas companies in the digital economy. The process of digitalization has now changed the technology of business processes, outlining new horizons for growth and development of the business environment. The ability to process large amounts of data in the shortest possible time becomes one of the main qualities that allow oil and gas companies to develop successfully. Managers of oil and gas companies are implementing digital technologies in the daily activities of the enterprise, despite the "specialists personnel shortage" in this field. Today, almost all large enterprises in the economy oil and gas sectors are implementing digitalization of business processes in order to reduce labor costs for routine office work: standard documents processing, including certificates, applications, reports, payment documents, declarations, contracts, that is, the main part of the document flow and almost any work related to the information processing is automated. However, digitalization is not limited to automation. Digitalization of business processes in oil and gas companies involves providing opportunities for geographically dispersed management groups of the company to share their operational experience, while maintaining the functional competence of the group members at a remote distance.

Keywords: Digitalization, business processes, oil and gas company, cyber security.

https://dx.doi.org/10.15405/epsbs.2019.03.122
Corresponding Author: D. R. Peskova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

The analysis of modern scientific views on the digital economy showed that at the level of economic entities digital development of production and logistics processes are manifested through the creation of multi-level information and digital platforms and operators that allow to solve various economic problems (neo-industrialization, regulation and planning, development of science and technology, personnel management), mass transfer of industrial and post-industrial technologies to digital, creation and widespread use of cloud technologies, cognitive service, artificial intelligence, big data processing, etc (Kulkov, 2017). Consequently, the intensive use of digital technologies leads to the accelerated development of not only industry, but also the financial sector, construction, transport, trade, communications, health, science, education and other industries (Schembre-McCabe & Kamath, 2018). There is a transformation of industrial relations due to modern algorithms of information processing and computer operation, the boundaries between physical, biological and socio-economic systems are blurred (Evjemo, Reegard, & Fernandes, 2015). This leads to the emergence of new interaction models between agents and systems in economic processes. According to the European Commission, the digital economy is estimated at 3.2 trillion euros in the Group of G20 countries and is about 8% of GDP. In the study conducted in May, 2011 the global Mackenzie Institute noted that the Internet is an essential element of economic progress. It provides a significant part of economic growth: the contribution of the Internet to the GDP of developed countries for the 15-year period from 1995 to 2009 the total was 10%, and over the past 5 years (2012-2017) it has doubled – to 21% (Babkin, 2017).

2. Problem Statement

Digitalization of the oil and gas industry is a priority for the Russian economy. This is due to the technological and structural transformation of business processes, which involves not only the replacement of production tools, but also the introduction of analytical systems that make production as profitable as possible, i.e. deep integration of technologies with business processes. The same processes are typical for foreign economies (Benevenuto, Lima, Brito, Quelhas, & Osvaldo, 2015). According to a survey conducted by Oil & Gas IQ among representatives of the largest international oil and gas companies, when answering the question "how can intelligent corporate systems affect your business?"65% were in favor of cost reduction, 45% – process improvement, 44% – modernization of the business, while 42% time savings and 35% win in the competition (Gululyan, 2017). The same opinion is shared by American authors Kohli & Johnson (2011) relying in their research on the experience of Encana Oil & Gas (USA). High fixed costs and lower gas prices require Encana to synchronize production with natural gas demand, which is only possible with transparency of all operational processes for the digital technologies implementation for the collection, integration and provision of information, the creation of new information systems management (IS) policies and the revision of the IS organizational structure. Thus, the aim of this work is to study the impact of the business digitalization processes in oil and gas companies to reduce costs and maximize profits.

https://dx.doi.org/10.15405/epsbs.2019.03.122
Corresponding Author: D. R. Peskova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

3. Research Questions

Taken into account the gap existing in the literature on this subject, here are the questions for the present study:

- how the processes of digitalization of business processes in oil and gas companies are developed?
- what is the degree of positive impact of digitalization on reducing costs and maximizing profits?

4. Purpose of the Study

The purpose of this study is to analyze the impact of digitalization on the oil and gas companies business environment.

5. Research Methods

To solve research issues and achieve the goals the methods of synthesis and analysis were used.

In general effectiveness evaluation of the digital technology application in the oil industry and its modification in the form of digitalization of business processes is appropriate to consider in the context of common principles and methods used in the information technology implementation (Xinquan, Yulong, & Shilong, 2011; Zhilin, Lei, Lei, C., & Dengsheng & Dengsheng, 2012). Therefore, the methodological basis for evaluating the effectiveness of information technologies developed and used in Russian and foreign practice is taken as a basis. At the same time, information technology is understood as a set of operations related to the collection, storage, processing, interpretation, issuance of conclusions and decision-making based on this information (Parmiggiani, Monteiro, & Hepso, 2015). Therefore, in the future we will use the term "information conclusions" referring to the result of the complex of the above-mentioned operations that increase the reliability of management decisions (Kohler, Matzler, & Fueller, 2009). It is obvious that it is not enough to estimate the information conclusions costs: it is necessary to justify them in terms of cost.

The information base of the research consists of financial and technological data of Russian and foreign oil companies, analytical reviews on the use of digital fields in the oil and gas sector, analytical research centers data (such as CERA, Accenture, Deloitte, Pwc), materials of conferences, legislative and regulatory acts of the Russian Federation, monographs, scientific articles of domestic and foreign authors on the problems of development and use of digital technologies in the search, exploration and development of oil and gas fields, published in special literature and periodicals.

6. Findings

Digital transformation is one of the main factors of global economic growth. According to McKinsey Global Institute estimates, GDP can increase up to 22% in China by 2025 due to Internet technologies. In the USA, the expected increase in value created by digital technologies is no less impressive – here it can reach 1.6–2.2 trillion USD by 2025 (Khodkovskaya, Sergeeva, & Mukhametshin, 2018). According to the estimates of the consulting company, the potential economic effect of the digitalization of the Russian economy will increase the country's GDP by 2025 by 4.1-8.9 trillion rubles. (in 2015 prices), which will be from 19 to 34% of the total expected GDP growth.

https://dx.doi.org/10.15405/epsbs.2019.03.122
Corresponding Author: D. R. Peskova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

The transition to the digital economy in Russia is one of the main factors of GDP growth. It should be noted that in recent years in the development of the oil and gas industry it is necessary to introduce more and more complex fields, both in terms of reservoir characteristics and in terms of the area of objects location (Gululyan, 2017). Therefore, every year the digital economy occupies an increasing place in the economy of the country, which indicates the effectiveness of innovation for our country. There are various forecasts, both for Russia and for other countries, which conclude that the potential for rapid growth achieved through increased employment and large investments will soon be exhausted and digital technologies will be the only way to improve the situation of the economy. At present, one can observe the rapid development of the digital economy (Analytical statement, 2017). In the period from 2011 to 2017, the total volume of Russia's digital economy increased by 64%, which is 10.5 times faster than the country's GDP. As a result, the share of the digital economy in 2017 reached 4.8% of GDP.

In terms of ICT infrastructure, Russia occupies the 62nd place among 127 leading countries in 2017 (Analytical statement, 2017). The structure of this indicator includes the following indices: 44-ICT availability, 40-ICT use, 37-development of online public services, 32-development of e-government. However, the 62 place is not enough.

Russia lags the leading countries in terms of business digitalization. The private sector does not take advantage of the digital technologies active adoption by consumers, and invests little in the use of technological advances, productivity improvements and new products and services creation.

The volume of investments of private companies in digitalization is only 2.2% of GDP, while in the US it reaches 5%, in Western Europe – 3.9%, in Brazil – 3.6%.

According to the level of digitalization, the most important Russia’s industries lag the EU countries (Table 01), including oil and gas.

Table 01. The difference in the digitalization level between Russia and EU countries (%) in 2016.

Branches	**Difference**
ICT	- 23
Education	- 27
Financial activities	- 29
Trade	- 38
Construction	- 44
Health and social services	- 45
Chemicalandpharmaceuticalindustry	- 46
Oil and gas industry	- 54

Source: Analytical statement (2017). Available at: https://www.mckinsey.com/ru/~/media/McKinsey/Locations/Europe%20and%20Middle%20East/Russia/Our%20Insights/Digital%20Russia/Digital-Russia-report.ashx

Therefore, at present, Russian oil companies are in the role of catching up, while the global situation is that further delay may cost the loss of competitive positions, as digitalization allows to solve the problems of the business environment faster, more economical and with less risks, expands the horizons of opportunities. It should be mentioned that over the past 2 years, the oil and gas industry has made significant progress in mastering digital technologies and using them in various fields of professional activity. But this is only the beginning.

https://dx.doi.org/10.15405/epsbs.2019.03.122
Corresponding Author: D. R. Peskova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

The main digital technologies used in the oil and gas industry are as follows:

Big Data, neurotechnology and artificial intelligence, distributed registry systems, quantum technologies, new production technologies, etc. The implementation of these technologies into the business environment requires a large set of tasks. This is the collection, transfer, storage, access, processing, interpretation and protection of a huge array of data, making management decisions on their basis, control over their execution. The fundamental role of the Big Data direction (storage and processing of data exceeding 100 GB per day) should be noted. According to IBS, in May 2015, the global amount of data exceeded 6.5 zettabytes (1 ZB is a trillion gigabytes), while the volume of information increased by 1,300 times in 12 years. It is expected that by 2020 humanity will form 40-44 ZB of information and by 2025 will grow significantly. And this mega-data will generate business. The state of the world economy and its segments will depend to a large extent on the success of data transfer, storage, processing, use and protection. We must admit that so about 0.5% of the collected information is used for the business benefit. It is obvious that the priority is the high-quality processing of the information flow.

Considering the above tendency, oil companies are actively engaged in the introduction of smart wells into the business environment. If the world used the technology at 800 wells in 2011, only Rosneft had about 2,000 wells with signs of artificial intelligence by 2017. The Cambridge Association for energy research (CERA) estimates the potential for digitizing fields at 125 billion barrels — this is how much it is possible to increase the return of already discovered fields only by improving the work organization. According to expert estimates, the integrated use of IT-technologies allows oil companies to increase the oil recovery rate by 2-7 % and at the same time reduce operating costs by a quarter. The calculations carried out by Vygon Consulting show that in Russia by 2030 digital technologies, improving the efficiency of geological exploration and the speed of implementation of methods for increasing oil recovery and technologies for developing hard-to-recover reserves, are able to add to the current level of production about 155 million tons of oil, compensating for the volume of production at the depleted fields for many years. Expectations and prospects according to BP estimates, due to the development of all technologies, technically recoverable reserves can grow by 35%, and the cost price can decrease by 25%. Accenture Company found out that 36% of the world's oil companies are now actively using Big Data technology, another 38% intend to adopt it in the next 3-5 years. Even after the collapse of oil prices, most oil companies in the world did not abandon plans to introduce digital technologies. There is a growing demand for the services of geophysical service companies that process huge amounts of data, interpreting the results of seismic surveys. This is expensive but also brings significant benefits. The sighting drilling improves the efficiency of work. As a result, oil companies save up to $5-7 for every dollar invested in 3D seismic exploration. The Institute of oil and gas problems of the Russian Academy of Sciences is engaged in the recommendations study for intelligent and innovative development of the oil and gas industry. Studies conducted in cooperation with the companies and they have shown that the introduction of modern IT-technologies allows to restore the effective production of light low-viscosity oil in the flooded fields that have entered the late stage of development. In addition, digitalization creates favorable conditions for the development of hard-to-recover reserves and unconventional resources of oil and gas, the creation of new centers of oil and gas production. It should be noted that the software market

https://dx.doi.org/10.15405/epsbs.2019.03.122
Corresponding Author: D. R. Peskova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

of the main activities of oil and gas companies has reached a high level of concentration. Two thirds of the world market of specialized industry programs is controlled by five companies — Shlumberger, Landmark, Aspen Technology, Honeywell, Invensys. Energy giants also use the services of specialized companies. So, Shell and Aramco are actively involved in the decision of current and perspective tasks of the transnational company Computer Science Corporation. This should be borne in mind when creating import substitution programs, we should not create something new but only try to adapt existing solutions to specific conditions and projects. The main idea in processing automation was the transition from responding to problems to their prevention. Perhaps this is particularly evident in the downstream sector. A powerful impetus to the use of information technologies here was given by the transfer of control and automation equipment used at the refinery from pneumatic systems to analog and subsequently to digital electronic systems, which began in the late 1980s. This made it possible to engage in full-scale automation of all processes. The systems of advanced process control (APC — Advance Process Control), which are widely used in Russia, allow to strictly adhere to the established regime and set target functions, to respond quickly and effectively to any deviations from the norm. The use of in-line analyzers makes it possible to monitor the characteristics of raw materials and products in real time. Adjacent installations are combined into complexes, which allows you to synchronize processes, manage them from a single center.

Gazprom Neft is one of the leaders in the implementation of information technologies and automation of oil refining processes in Russia. In particular, the company's refineries actively use virtual quality analyzers — mathematical models that allow predicting quality indicators without their actual measurement on the basis of previously performed laboratory tests. A qualitatively new level of automation will be the transition to centralized production management. Pioneer projects of MCC are implemented at Omsk and Moscow refineries.

According to the forecasts from Oxford Economics by 2025 the Internet use in the oil and gas industry may grow by 0.8% (or 816 billion U.S. dollars). Availability of digital networks helps companies to take operational decisions in the course of operating activities with the aim of increasing the assets utilization, reduce running costs and improve the overall efficiency. This is since the introduction of digital technologies allows for the so-called compression of processes, their integration and interconnection. Processes compression is achieved by bringing them into one safe ecosystem of such components of the digital world as intellectual assets, electronic document management and data analytics. The introduction of digital technologies throughout the supply chain facilitates the processes simplification and synchronization, as well as the comprehensive consideration of decision-making circumstances. This is certainly not a new idea. Process compression has also been used quite successfully in other industries — such as the automotive and aerospace industries. Based on the complexity of the processes, the number of participants, and the impact of standardization and automation solutions on operating costs, EY identifies the most promising areas for process compression. Priority is given to the optimization of the production process management system, which is possible to be implemented at a relatively low cost by combining the network of equipment and production facilities, data sources and physical objects, making even more attractive the introduction of digitalization in business processes.

https://dx.doi.org/10.15405/epsbs.2019.03.122
Corresponding Author: D. R. Peskova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

In the oil and gas industry, big data analytics is used in both exploration and production and processing and marketing. Over the past decade, industry leaders have been actively investing in production automation, and these investments have already brought considerable returns. However, companies tend to benefit even more from these investments by analyzing the accumulated data.

Repsol uses data analytics to get a complete, detailed picture of its customers, as well as sales at each gas station (fuel, shop, cafe, related services). There are4700points in general. In particular, the decision tasks of sales on a petrol station helped to obtain better prices from suppliers, to reduce losses from loss of sales due to the timely formation of orders and select the appropriate range, to start the process of dissemination of best practices at every gas station, to obtain a reliable picture of the business franchise, undertake more effective promotions, reduce employee theft, to establish flexible prices. The accumulated data becomes an asset of the enterprise, the same as fixed assets or financial investments. It has already taken root and no one is surprised by the slogan that "data is new oil". At Gazprom Neft, the understanding of the new reality has led to a process of digital transformation, which is realized through the work with big data. In addition, the oil industry will be competitive when services in this sector are effective, from exploration to the production of the necessary equipment. It is oilfield service that plays an important role in solving many problems arising in the process of effective oil production. Competitive service, being an innovative tool, builds effective logistics chains between economic entities, including the scientific and educational complex. The role of the oil and gas sector in the Russian economy is very significant, so it should be noted that oil service can become a key component of all operating systems in the digital economy (Gululyan, 2017).

7. Conclusion

Thus, the digitalization of business processes in oil and gas companies will allow to implement the following activities:

- products and services will be created on a project basis using globally all the necessary resources by renting for the required time;
- the economy will operate in a single information space (using cloud technologies), which brings together all the necessary resources (specialists, tools, technologies, online production, Finance) for design, production and operation;
- global corporations will receive up to 100 % of revenues from the service of sold products and services with 5-10 % of initial investments in the production of these goods and services (cloud volunteer model) and 0 % in marketing;
- the operator of the global platform of industrial ecosystems will be the unconditional beneficiary in the new conditions. In fact, it is a kind of production environment in the new conditions (production of means of production).

The development of the digital economy in Russia currently contributes to increased competition of human capital, increase productivity and skills of labor resources, lower prices, facilitate access to information resources, etc. The use of digital solutions in the business environment makes it possible to increase competitiveness and efficiency by effectively responding to the situation, the objective reflection

of which is facilitated by monitoring and comprehensive analysis of the array of data coming from each element of the system, even every gas station.

References

Analytical statement. (2017). Digital Russia: new reality. Mckinsey report. Retrieved from URL: https://www.mckinsey.com/ru/~/media/McKinsey/Locations/Europe%20and%20Middle%20East/Russia/Our%20Insights/Digital%20Russia/Digital-Russia-report.ashx.

Benevenuto, C., Lima, C., Brito, G., Quelhas, G., & Osvaldo, L. (2015). Integrated operations: value of and approach to the oil industry. *Brazilian Journal of Operations & Production Management*, *12*, 74-87. https://dx.doi.org/10.14488/BJOPM.2015.v12.n1.a8.

Babkin, A. (2017) *Digital transformation of economy and industry: problems and prospects*. St. Petersburg: Publishing house of Polytechnic Institute.

Evjemo, T., Reegard, K., & Fernandes, A. (2015). Telemedicine in oil and gas: current state and potential improvements. *Procedia Manufacturing*, *3*, 1289-1296. https://dx.doi.org/10.1016/j.promfg.2015.07.274.

Gululyan, A. (2017). *Evaluation of the economic efficiency of the use of digital technologies fields when making management decisions in the oil and gas industry*. Moscow: Russian State University of Oil and Gas (national research University) named after I. M. Gubkin.

Khodkovskaya, Yu., Sergeeva, O., & Mukhametshin, E. (2018). Business strategy organization competitive oilfield services market in Russia. *Eurasian Law Journal*, *2*, 351-353.

Kohli, R., & Johnson, S. (2011). Digital transformation in latecomer industries: CIO and CEO leadership lessons from Encana Oil & Gas (USA) inc. *MIS quarterly executive*, *10*, 141-156. Retrieved from URL: https://aisel.aisnet.org/misqe/vol10/iss4/3.

Kohler, T., Matzler, K., & Fueller, J. (2009). Innovation: using virtual worlds to innovate in the real world. *Technovation*. *29*, 395-407. https://dx.doi.org/10.1016/j.technovation.2008.11.004.

Kulkov, V. (2017). Digital economy. Hopes and illusions. *Philosophy of Economy*, *5*, 145-156.

Parmiggiani, E., Monteiro, E., & Hepso, V. (2015). Digital coral: infrastructure environmental monitoring. Computer supported cooperative work. *The Journal of Collaborative Computing*, 24, 423-460. https://dx.doi.org/10.1007/s10606-015-9233-6.

Schembre-McCabe, J., & Kamath, J. (2018). Using Digital Rock technology for quality control and reduction of uncertainty in relative permeability measurements. *Petrophysics*, *59*, 44-53. https://dx.doi.org/10.30632/PETRO_059_1_A4.

Xinquan, R., Yulong, G., & Shilong, C. (2011). Innovations and practices of oil field digital management. In *Advanced Materials and Information Technology Processing*: *Proceedings of International Conference (AMITP 2011)*, (pp. 264-269). DOI: 10.4028/www.scientific.net/AMR.271-273.264.

Zhilin, Q., Lei, C., & Dengsheng, L. (2012). Thinking cloud computing in the digital construction of oil companies. *Applied Physics and Industrial Engineering (ICAPIE): Proceedings of International Conference, 24*, 640-644.