Applications of the digital economics tools in the spatial industry

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Abstract. The subject of the research is the digital economics tools applied in spatial industry and enterprises in the context of integration into the digital economy. The process of digitalization of economy and society, the increase of information volumes, data complexity and diversity of data sources with the parallel increase in the value of information create the need for essentially new methods, and tools of managing the spatial industry. The aim of the research was to study the tools of the digital economy in terms of their contribution to the efficient functioning of the space industry in the Russian Federation. The research is supported by the need to introduce new economic tools that ensure the digitization process in the space industry. The introduction of digital technologies and tools of the digital economy in companies generates the need to take into account the specific characteristics of production processes, the existing technical infrastructure, the composition and structure of production facilities, as well as the training of personnel. The paper concludes that the introduction of digital economy tools in the space industry is essential for the optimization of production processes and adaptation to the new digital era in this industry, as well as the development of it. Keywords: digital economy; digital economy tools; spatial industry.

1 Introduction

Digitalization is the transformation of information into digital form or digital transmission encoded into discrete signals-pulses. In consequence, under the digital economy refers to the economic activity, based on the digital technology related to e-commerce-electronic products that produce and market these products and services and contribute to increasing the efficiency and transparency of the production of goods, provision of services. Thanks to digitalization the development vector of all industries is constantly changing the economy is moving towards the increasing use of digital technologies. Along with lean manufacturing technologies, universal digitalization has become a trend in recent years, and the use of IT in the field of design and design, production management at all stages of the product life cycle, it becomes an integral part of the process of complex changes launched at Russian enterprises. Digitalization is revolutionizing the global economy. For industrial enterprises, the introduction of digital economy tools allows reduce the time for
goods to enter the market, increase quality of products and services and use new ones
business models [1].

The main trend in the development of digital transformation is the replacement of all the
usual ways of using IT services with a service model, and, accordingly, the inevitable
digital transformation of all IT companies and the consistent services of not only their
business, but also related economic and social processes.

2 Digital’s economy tools

The tools of the digital economy in the industry are understood as tools for end-to-end
digitization of all physical assets of an enterprise and their integration into digital
ecosystems with the data of business partners of the enterprise. In practice, such tools
represent a fairly wide range of new technologies used. They are clearly presented in Figure
2. The concept of "Industry 4.0" as show in Figure 1 is synonymous with the fourth
industrial revolution, combining projects of the fourth industrial revolution and their
implementation at enterprises.

As follows from Figure 2, in industry, the tools of the digital economy can be
classified into three groups:
1) tools for digitizing and combining vertical and horizontal value chains;
2) tools used to create a digital business model, its functioning and tools that provide
access to customers;
3) tools for digitizing the offers of goods and services of industrial enterprises.

Digital technologies have long been used in Russian industrial enterprises. With they
appeared long before the economy became total digitalization is being introduced. For
example, over the past 20 years, CAM/CAD models (computer-aided design systems) have
been used in the aviation industry — level 2 of the reference model), electronic
technologies for creating aerospace models that are tested in wind tunnels.

Digitalization of applied research makes it possible to work out various approaches to
the creation of new equipment at the stage of development work, as well as in real time,
allowing you to track the technical readiness— the product's stability in a wide range of
parameters.

There are also high-tech projects that are implemented on the basis of digital modeling
and design technologies. But in all applied areas of using digital economy tools, Russia's
starting positions are different.

For example, the projects "Infowatch" 2 and "Laboratories Kaspersky" can be applied
to the tasks of digitalization of the industry. However, in our opinion, Russia is at an initial
stage in the production of industrial robots or equipment for additive manufacturing.

To date, according to the materials of the All-Russian forum "Digital Economy and
Defense Industry Russia: best practices and solutions, assessment of adaptability and
forecast" (held on March 22, 2018 on the basis of FSUE "Central Research Institute
"Center"), organized by the Institute of Economic Strategies (INES) with the participation
of the Military - Industrial Commission, the Ministry of Industry and Trade of Russia, the
Russian Academy of Sciences, digital technologies presented in the table are actively used.
It follows from the table that the most active instrument of the digital economy used in
industry is "electronic trading as the main tool for the acquisition of inventory items" and
"high-speed broadband communication networks available for use by the enterprise".

In general, we can note that digital technologies are so diverse and are developing so
quickly that not all industrial enterprises can master them independently [1].
Fig. 1. Industry 4.0 [2].

Fig. 2. The tools of the digital economy in the industry [1].
Cloud technologies. In a simple way, cloud computing is a technology that allows remote access to software, file storage and data processing through the Internet, thus being an alternative to running on a personal computer or local server. In the cloud model, there is no need to install applications locally on computers. Cloud computing offers individuals and businesses the capability of a well-maintained, secure, easily accessible and on-demand computing resource pool.

IoT platform. Is the basis for devices to be interconnected and create an ecosystem of their own. In other words and according to Link-labs, a web platform integrated to the Internet of Things (IoT) is the software that connects hardware, access points and data networks to what is usually the application that the user enjoys.

The market for IoT platforms is booming and continuously expanding, in fact there are surveys that say that more than 80% of companies believe that the field of the Internet of Things is the most interesting for their businesses. In addition, these platforms are necessary to solve middleware problems, which is the so-called “plumbing” of the IoT [3].

Mobile devices. A mobile device can be defined with four characteristics that differentiate it from other devices that, although they may seem similar, lack some of the characteristics of real mobile devices.

These four characteristics are:

- Mobility. The most obvious feature of a mobile device is precisely that it is mobile. Mobility is understood as the quality of a device to be transported or moved frequently and easily. Therefore, the concept of mobility is a basic feature. Mobile devices are those that are small enough to be transported and used during transport.

- Small size. Small size is understood as the quality of a mobile device to be easily used with one or two hands without the need for any external help or support. The small size also allows the device to be transported comfortably by one person.

- Wireless communication capability. Another important concept is the term wireless. Wireless communication means the ability of a device to send or receive data without the need for a wired link. Therefore, a wireless device is one capable of communicating or accessing a wireless network (e.g. a mobile phone or a PDA).

- Ability to interact with people. Interaction is understood as the process of use that a user establishes with a device. Among other factors, interaction design involves disciplines such as usability and ergonomics. As we have seen, the diversity of terms, definitions and characteristics associated with mobile devices increases and changes every day, which is typical of technologies that are in continuous evolution and development. Among them we have mobile phones, tablets, etc. [4]

Augmented Reality (AR) is a technology that allows us to superimpose virtual elements on our vision of reality. Increasingly in demand, in 2020 it will become a business that touches the 120,000 million dollars worldwide. [5]

Big data is a term that describes the large volume of data – structured and unstructured- that floods a company every day. But it's not the amount of data that matters. What matters is what organizations do with data. Big data can be analyzed to obtain insights that lead to better decisions and strategic business actions. [6]

Intelligent sensor. Is a device that takes data from the physical environment and uses embedded computing resources to perform predefined functions by detecting a specific input and then processing the data before transmitting it. [7]

3D printing, also called addition manufacturing, is a set of processes that produce objects through the addition of material in layers corresponding to the successive cross sections of a 3D model. [8]

Location-aware technology includes sensors and methods for detecting or calculating the geographical position of a person, a mobile device or other moving objects. The most
common location-aware technologies are GPS, assisted GPS (A-GPS), Wi-Fi, Enhanced Observed Time Difference (E-OTD) and Enhanced GPS (E-GPS). [9]

A neural network is a simplified model that emulates the way the human brain processes information: It functions simultaneously by a large number of interconnected processing units that look like abstract versions of neurons. Processing units are arranged in layers. [10]

These are roughly, the main digital tools in industry 4.0. Its application to the space industry must be defined through application algorithms on this specific industry, taking into account its essential characteristics and objectives.

In the case of the space industry, cloud services are becoming more and more interesting for its actors. More and more companies have made the leap into Earth orbit. Advances in telecommunications systems call for more satellites and infrastructure to be deployed in this area of near-Earth space. And in many cases these systems need cloud services to support their operations. To capitalize on this need, Amazon has created Aerospace and Satellite Solutions, as a branch of its AWS cloud division.

It's not the only company that targets space companies. Microsoft has also redoubled its efforts in this area. Its cloud Azure platform has gained several clients of stature in this emerging market. They are the satellite operators Intelsat, Inmarsat, SES and Viasat.

The initiative of these two cloud giants is part of the growing interest in the space market. As more and more private companies have entered this area, the need for services increases. Moreover, the low cost of launching satellites and putting infrastructure into orbit has expanded this type of business.

AWS's new business segment, Aerospace and Satellite Solutions, is a statement of intent. It is based on the conviction that we will increasingly need information from space for decision-making in different areas. This information will become valuable, valuable and profitable. And cloud services are key to the proper management of this information. It's not Amazon's first step in this direction. Jeff Bezos' company is arguably the best positioned to take advantage of the need for cloud services from space. Not just because of their market dominance. The firm has moved before any to create a business structure with which to address this sector. Prior to the creation of the Aerospace and Satellite Solutions segment, AWS had already created Ground Station. This service allows flexible rental (pay per use) of Amazon base stations to operate satellites. It thus introduces a novel concept in a sector as seemingly immobile as the provision of services to the space industry.

It is still a measure to approach the non-traditional private sector that assaults space. These new players are not like space agencies or satellite giants, who work with contracts that are quite rigid in terms and duration. New companies seek more flexibility and favor competition in the provision of services. [11]

3 Conclusions

Digital economy tools in industry refer to the means of end-to-end digitization of all the physical assets of the company and their integration into the digital ecosystems with the data of the business partners of the company. The systematization of digital technologies allows set that they can be classified into three groups: scanning tools and vertical and horizontal combination value chains; the tools used to create a digital business model, its operation, and the tools they provide customer access; tools for digitizing the offers of goods and services of industrial companies.

The considered experience of the digitalization of Russian industrial enterprises has made it possible to establish that the most active tool of the digital economy used in industry are "electronic markets as the main instrument of acquisition of material goods" and "high-speed broadband communications networks available for business use."
Digital technologies are so diverse and developing so rapidly that not all industrial companies dominate them on their own. With an effective algorithm for the introduction of digital economy tools in industrial companies, it would allow unify the procedure for integrating digital technologies into management and production processes in companies. The services of cloud and location-aware technology are being more attractive for spatial industries around the world.

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