Global Supply Chain Trends in the Digital Economy Development and Its Individual Tools

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Abstract The modern development of the world economy is accompanied by an increase in the role of science and innovation, the spread of information and communication technologies (ICT), including robotics. Today, ICT can be considered a leading factor in the arrangement of production and business processes, education, interaction of various subjects of society (state, organizations, and population), obtaining knowledge and information, leisure activities, and trade. ICT strengthen the material and technical base and stimulate socio-economic development, increasing the competitiveness and productive potential of the country's economy. This topic is currently relevant, as the information society involves the widespread use of various information technologies in all areas of our activities. For example, at the moment in our society, a huge role is played by robotics, systems for distributing, storing and processing information that are based on computers. More and more inter-regional and international connections are being formed, which allows the exchange of information over long distances in the shortest possible time. In addition, the number of organizations using robotics is growing every day.

Keywords: *Information, supply chain management, communication technologies, robotics in the world economy, digital economy*

1. Introduction

In international practice, there is still no harmonized definition of the digital economy, not to mention the tools used by it. In most foreign sources, when describing the digital economy, the focus is on technologies and changes in the way economic agents interact related to their use. In fact, they are the tools by which the digital economy functions.

This may include either specific types of technologies, or certain forms of changes in economic processes. One of the most promising tools of the digital economy is robotics, or robots.

Often, the definition of the digital economy is replaced by a list of areas of its impact on the economy and social sphere. However, this does not prevent the objective development of economic processes that promote the introduction of information and communication technologies, including robots. This, in turn, affects the use of resources in industries that use digital technologies, which in turn determines trends in the development of the digital economy [1-5].

2. Methodology

Research aim. The aim of the research is to identify trends in the development of digital technologies in the Global supply chain management economy.

Research tasks:

- to study the dynamics and trends of the digital economy in the developed countries of the world;
- to study trends in the use of digital economy tools in the world's leading firms.

Materials and methods. The paper uses systematic, comparative, monographic and other research methods. Published works of research institutions of the Russian Academy of Sciences, universities, and statistical materials at the Federal and regional levels were used as materials.

Results and discussion.

The contribution of the digital sector (production and trade of IT equipment, services and amenities, development of software and digital goods, telecommunications – hereinafter referred to as the "ICT sector") to the Russian economy is relatively small in comparison with the economies of developed countries. So, in 2017 its share in the economy was 3% of GDP. At the same time, in most developed countries, the size of the digital sector averages 6-7% of GDP. In France ─ 5.7%, in Germany - 6.3%, in the UK - 7.1%, in the US - 7.4%, and in Sweden - 8.6%. In absolute terms, Russia's digital sector is also relatively small - in 2017 its size was 2.5 trillion rubles (according to purchasing power parity (PPP) 103 billion dollars). At the same time, in Japan, with a comparable population, the size of the digital sector is estimated by the Institute for Growth Economics to be almost 3.5 times larger ($355 billion). In the United States with twice the population – by 13 times (1,348 billion dollars) [6-12].

3. Results

The Russian ICT sector has a critically small number of enterprises. As of 2017, there were only 0.8 ICT enterprises per 1,000 people. In developed countries, the average number of enterprises per 1,000 people is 2.7, which is 3 times more than in Russia. Germany, which has 1.3 enterprises per thousand people, is making serious efforts to correct the situation: in recent years, the number of enterprises has decreased by more than 40%. As technological and innovative enterprises are the driver of the digital economy, their small number in Russia creates serious risks for the country's digital development [13-17].

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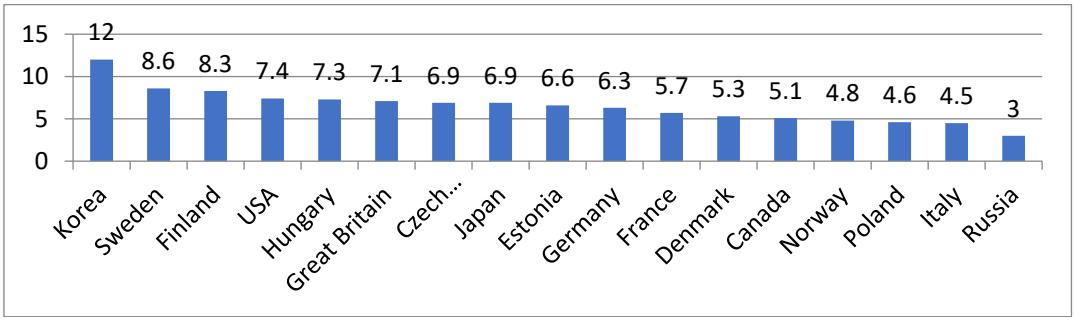

Figure 1. – Share of the digital economy in GDP, %

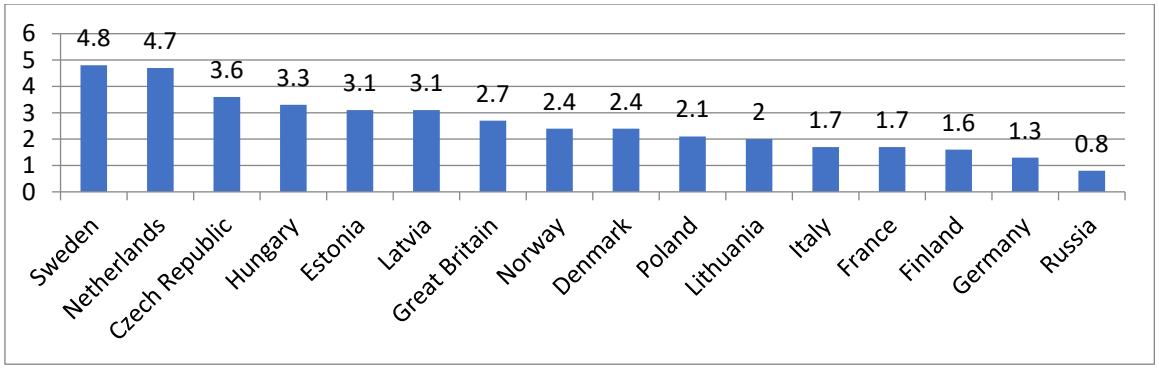

Figure 2. - Number of enterprises in the information and communication technology sector per 1000 people, units

In 2017, the number of people employed in the ICT sector in Russia was 1.7% of the total number of people employed in the economy (1.2 million people). This value is significantly lower than in most developed countries, where it averages about 3%. For comparison, 2.7% of employees work in the ICT sector in France, 2.9% in Germany, 3.1% in the United States, and 3.5% in Great Britain. The low share of the ICT sector in employment once again confirms that the digital sector in Russia is relatively small.

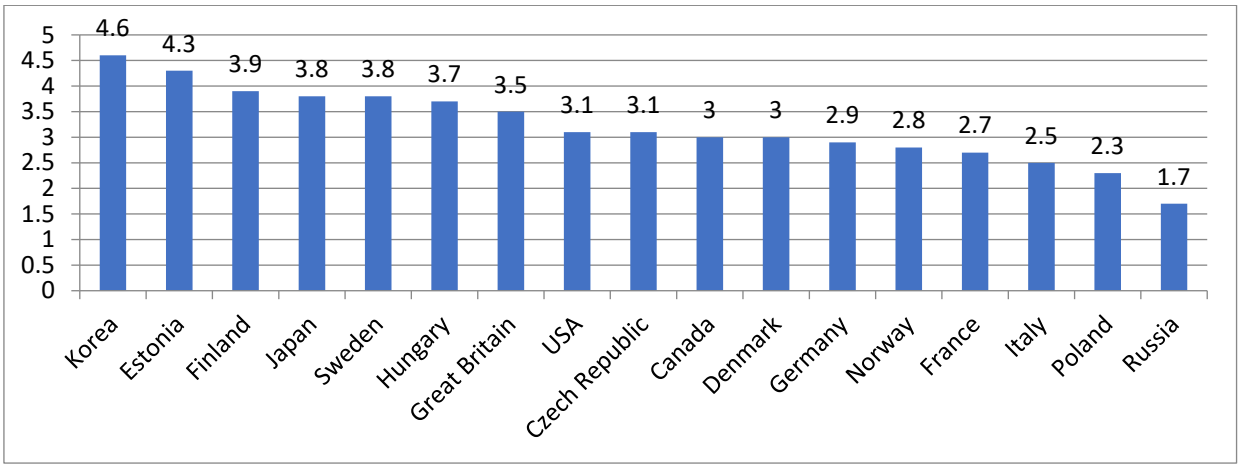

Figure 3. - Percentage of employees in the information and communication technology sector of the total number of employees, %

The Russian economy also shows a low indicator in terms of the number of employees per 1,000 employees - this indicator is 8.4 employees, while the average in developed countries is 16 employees. The almost two-fold gap in the number of employees in the sector allows talking about potential new jobs that have not appeared yet due to the lack of development of the sector. In many ways, this lag is caused by an insufficient number of companies working and developing projects in the field of hardware production and software development [16].

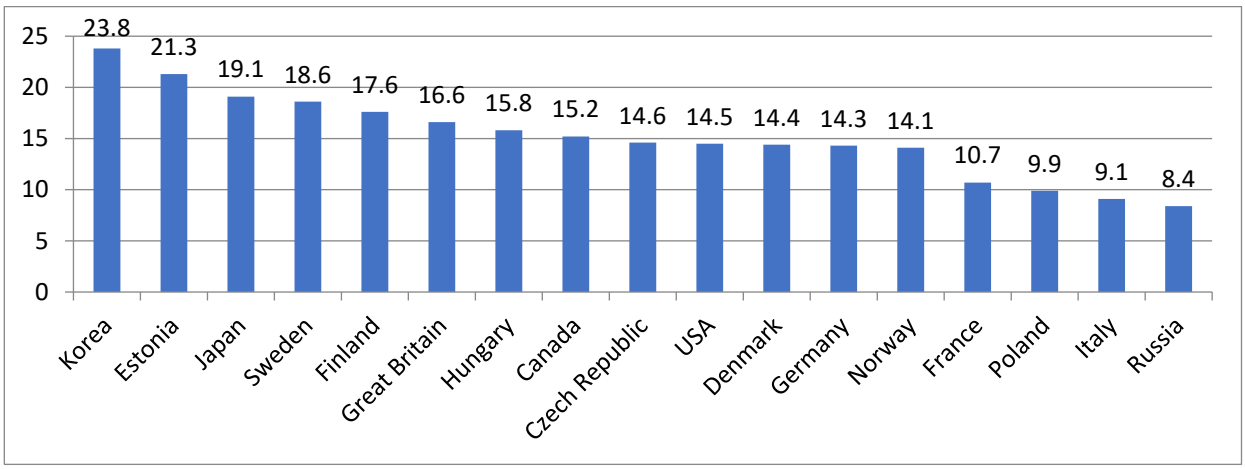

Figure 4. - Number of employees in the information and communication technology sector per 1000 people, units

Labor productivity in the Russian ICT sector is at an average loss, surpassing most Eastern European States (including EU members). The average labor productivity in European countries is 100 thousand dollars (according to PPP), which is a third higher than in Russia. In many ways, this level of productivity is a consequence of significantly lower employment in the Russian ICT sector than in Eastern European countries (Russia has fairly developed sectors with "low" employment – sphere of telecommunications, a number of manufacturing enterprises - in the field of dual use products and space communications, etc.). In 2017, the added value per 1 employee in the ICT sector in Russia was 1.8 million rubles, or $ 75 thousand (PPP). However, this value is much lower than in Finland, France, Germany, Sweden, Great Britain and Norway. In these countries, there is a closer connection between digital technologies and applied software products - primarily in the field of financial technologies, new equipment is being developed, and modern technologies are being introduced.

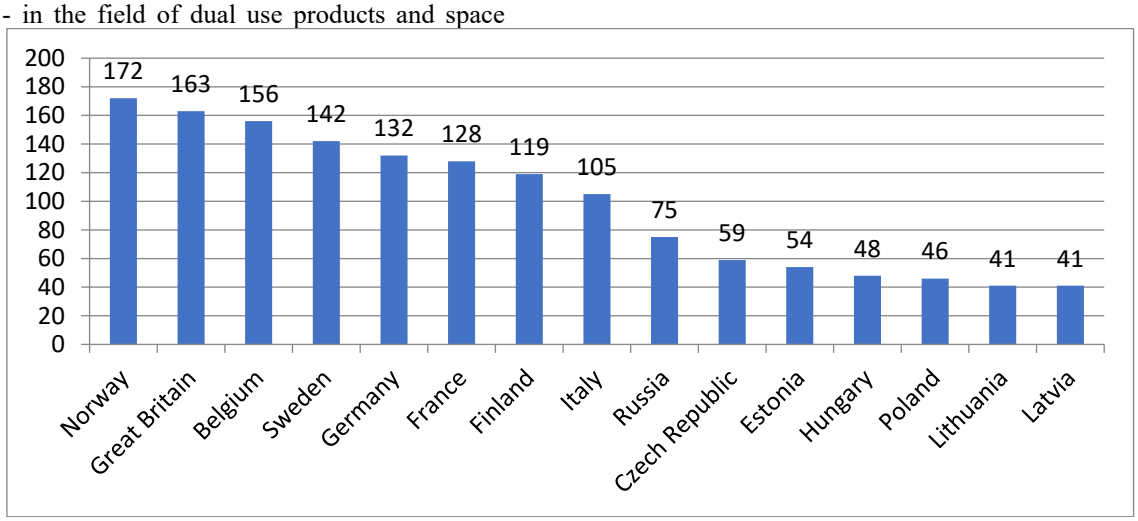

Figure 5. - Added value per 1 employee in the information and communication technology sector, thousand dollars (at purchasing power parity)

All of the above affects the development of robotics in the world's leading companies in developed countries.

Amazon opens stores without cashiers, where the cost of goods is automatically debited from the customer's card, and also actively implements robotics in warehouses. Walmart has patented a cart that accompanies the customer in the store and gives them advice on choosing a product. American discount chain Target uses robots to track the number of products on the shelves and correct pricing [4].

In the Russian retail trade, the number of projects involving robots is still significantly lower. According to the National Association of Robotics Market participants (NARM), the density of robotics in Russia is 70 times lower than in the whole world. For example: in 2015, there were averages of 69 industrial robots per 10,000 employees in the world, while in Russia there was only one.

However, some Russian companies develop and sell service robots relatively successfully. For example, Alfa Robotics (Moscow) has developed an anthropomorphic robot-promoter KiKi to work with customers of supermarkets and shopping centers. Perm company Promobot produces robots that support speech communication, which the Lenta chain has already started using in its stores [2].

According to the international consulting company CBRE, by 2030, automation and robotics will change the number of jobs in retail: machines will replace sellers and cashiers. Robotics projects in retail are aimed at improving customer service and optimizing internal business processes.

One of the areas in which robots have been already involved in the West is the delivery of goods. Unmanned

aerial vehicles are used to move through the air, and courier robots are used on the ground.

In 2014, two Estonians, the creators of the Skype messenger – Janus Friis and Ahti Heinla – founded the company Starship Technologies. A year later, the company introduced its first development – a street delivery robot. The robot courier looks like a platform on six wheels and can accommodate loads weighing up to 18 kg. It is able to move independently on the sidewalk, avoiding obstacles and pedestrians. Retailers such as Metro Group, Hermès and Domino's Pizza have already expressed interest in the new product.

Robot couriers allow reducing the delivery time and costs of the so-called "last mile". For example, delivery by courier in the centre of London costs around $15, while the Starship robot reduces the amount to $1.2.

The pioneer of the use of drones in trade is considered to be the American online retailer Amazon. The company launched commercial delivery of cargo using drones in December 2016 in the UK. The first customer was a resident of the Cambridge suburb who ordered a bag of popcorn and a game console – he received his goods in 13 minutes.

In recent years, Amazon has been actively developing the Prime Air project, which involves the creation of an air transport network for order delivery. The project uses drones about a meter long, capable of delivering cargo weighing up to 2.4 kg. The flight is autonomous – the drone is controlled by built-in electronics [5].

Obviously, the future of retail is in automated delivery: this is evidenced by the fact that in 2017 Amazon patented hive warehouses for drones. It is assumed that they will be built in the central areas of major cities. Now warehouse complexes are usually located on the outskirts, which increases the delivery time. Multi-level centers look like tall towers with runways for unmanned vehicles.

The DPD transport company drone in Europe transports cargo weighing up to 3 kg over a distance of up to 20 km. The device is equipped with GPS, navigation system and a camera that transmits data in real time and records the flight. For safety reasons, the drone has a built-in backup electronics and a parachute that opens when it drops sharply. The device takes off, lands, and returns to the base station on its own.

4. Discussion

In Russian retail, examples of using robot couriers are still rare. In the summer of 2014, Dodo Pizza launched delivery of orders using drones in Syktyvkar. However, it soon received a warning from the authorities: the company was threatened with a fine. According to Gosavianadzor, the commercial use of drones falls under Article 11.4 of the Administrative Code of the Russian Federation "Violation of the rules for the use of airspace".

Before implementing order delivery by air, Amazon received permission from the UK civil aviation authority. It is Britain that is considered the country with the most liberal approach to regulation in the field of unmanned aerial vehicles.

"In our country, the use of drones has not left the experimental stage, not least because of the lack of state regulation. But in the distant future, automated delivery systems will play an increasingly significant role in Global supply chain management logistics, including in Russia".

Robots have also found their application in the warehouse sector. Currently, there are several types of warehouse robots, as well as complete solutions for warehouse automation using different types of robotics. Robot carts move pallets around the warehouse. Robot palletizers automatically capture and stack products on pallets. Sorting robots help with packaging: they can disassemble and identify products. They also find with products defects.

So, SAP is currently doing a pilot project on product quality analysis, the purpose of which is to detect automatically rotten tomatoes in boxes. Automation will solve several tasks: it will relieve the staff that checks the quality manually, and speed up the time and efficiency of verification.

Warehouse robots are actively used by Global supply chain management retail giants. Amazon started using robotics in 2014: these were mechanisms for moving pallets from Kiva Systems. 2 years later, the company bought the developer and renamed it Amazon Robotics. As of the end of 2017, more than 100 thousand robots were working in the company branches around the world. At the same time, the company was able to do without reducing warehouse employees: now they manage the work of their "automatic colleagues". Due to warehouse robotics, Amazon has significantly reduced the delivery time: a customer can place an order in the morning and receive it before lunch.

British online retailer Ocado has implemented an automatic order collection system, which has accelerated the process several times. The warehouse space looks like a multi-level structure, which is filled with cells with goods. Robots move along the rails from above: they find the necessary goods in the cells, collect the order and pass it to the warehouse employee for final packaging.

The company Symbotic developing autonomous warehouse robots. They move through the aisles, take out boxes of goods and stack them, and interact with ordinary warehouse robots that move only along certain routes and have limited functionality.

When the retailer Target decided to expand its distribution center in California, Symbotic offered a technological solution that did not require the construction of additional warehouses. Unlike the usual warehouse complexes, where the goods are stored in a certain place, Symbotic robots place boxes on any empty space on the shelves – this saves space. It is easy to find a product because the technology remembers the location. Walmart subsequently became interested in the solution.

In Russia, the issue of full warehouse automation is still open from the point of view of economic feasibility. The economic situation does not contribute to the creation of expensive, and most importantly, not universal warehouse solutions with a long depreciation period. At the moment, Russian retail is in full swing optimization of warehouse processes, automation of sites that can be automated without capital long-term costs. Universal solutions are also being developed, such as robotic carts and loaders, which exclude the presence of a person in only one or several process chains".

Today, one of the most mature and promising areas for robotics in this area is the concept of "dark warehouse". This is a fully autonomous facility where robots work alone in the dark, which, among other things, reduces electricity costs.

Another area of use of robots in retail is as consultants and service personnel directly in sales halls. Robot consultants show where the product is on the shelf, or give advice based on customer experience. This assistant already works with users of the American home goods chain Lowe's.

The Tally robot produced by the American company Simple Robotics automates the process of revision of supermarket shelves. It tracks the availability of the product and the correctness of the specified prices. The robot takes only an hour to check a standard supermarket, which is much less than when performing a task with "live" employees.

In September 2017, the Zara network launched a robotic point of delivery for online orders. It is equipped with a terminal with a touch panel and a QR code scanner. The buyer receives the code when placing an order on the site. Using this data, the system finds the purchase and issues it to the customer.

In November, the Lenta superstore chain announced the launch of a joint project with Promobot. Service robots will work in several Lenta stores, telling customers about promotions and discounts on products. They can move freely around the room and recognize customers due to the facial recognition function.

The Russian company Alfa Robotics specializes in the production of commercial robotics. The flagship product is a robot with advanced functionality for verbal and non-verbal communication KIKI. The robot promoter can work in a shopping and entertainment complex: meet visitors and escort them to the necessary departments, introduce them to products and services, inform about discounts and entertain children. The company also produces and sells a robotic self-service checkout ARC 70 with interactive voice communication, which can recognize faces and product types by image.

Service robotics is going through a stage of development and growth. This is confirmed by a study by the International Federation of Robotics: in their forecasts, they promise to increase the number of service robots by 10-15 times in the next year or two. This refers to robots that communicate with humans. It is expected that robotics will be actively used in such areas as retail, hotel and restaurant business, and events".

And, although this area is developing, the sales market is only being formed. While there is a mutual "targeting" of potential consumers and manufacturers of robotics, opportunities and needs are evaluated. As with any new emerging technology, distortions are inevitable. On the one hand, in the form of high expectations, on the other hand, the impossibility of their implementation. For example, hoteliers want a single robot to perform many functions: receiving guests, check-in, check-out, serving things, ironing clothes, making coffee or tea. All this can be robotized, but each task will require its own robot [3].

According to the Gartner, in 2 years, 30% of search queries will be voice-activated. This will be facilitated by the growing popularity of "smart" speakers, such as Google Home, Apple HomePod and their analogues. According to official information from Amazon, millions of Echo Dots smart home devices with the Alexa voice assistant were purchased during the New Year's sales last year. Smart speakers can communicate with their owners, answer questions, inform about the weather and traffic jams, and place orders in online and offline stores. Retailers bid on the latter feature [6].

At the end of 2017, Google and the Target store chain announced a partnership in the delivery of goods throughout the continental United States. Customers can place an order using the Google Home column and get it to their home or office. Thus, sellers are trying to fight the active expansion of Amazon.

So far, most "smart" speakers understand only English, so they are not in demand among Russian consumers. However, Yandex recently announced the development of its own smart speaker aimed at users from the Russian Federation. The voice assistant Alice will be responsible for communication with the owner.

"Conversational robots", which are based on speech recognition and synthesis technology, have been already used by Russian companies. For example, the DPD call center employs a robot named Yulia. Initially, Yulia made outgoing calls, informing recipients about the delivery status. Since autumn, the robot also responds to incoming calls. In December, Yulia made 28% of outgoing calls, in January – already 30%, incoming calls: in December 24% and 28% in January. The rest was handled by operators.

Chat-bots are computer programs that can maintain a written dialogue with the user. In retail, they are mainly used for consultations, accepting orders, and sales. The robot of the clothing chain H&M selects product options by parameters. The Sephora bot works similarly. The Burger King bot suggests the restaurant closest to the user where they can pick up their order.

Russian company ChatFirst develops chat-bots with artificial intelligence. They automate the process of handling customer claims and complaints. The bot helps navigate how to respond and what to do in each specific situation.

The company also has developed a virtual assistant for HR support to the employees of Leroy Merlin. RH Ira (that is its name) is asked questions about paperwork, vacations, and social benefits. The chain has 75 stores in different time zones that employ more than 23,000 people. Their working day does not always coincide with the HR manager's work schedule. The virtual assistant is available around the clock, seven days a week, so the cashier, for example, from Khabarovsk, can consult at any time.

5. Conclusions.

Global supply chain management trends in the development of the digital economy are natural and are largely explained by the development of technology, the high cost of labor in developed countries, and the need to reduce the cost of products in order to increase their competitiveness and quality. From the above, it follows that the digital economy in Russia is beginning its formation, which is due to objective factors of its development. Such as the use of modern advances in robotics. Despite the fact that in the world, robotics is actively developing, while replacing a significant amount of labor, in Russia this process is just beginning. It is obvious that, on the one hand, the state needs to support companies that will use robotics, on the other hand, it is necessary to provide guarantees of income generation and possibly re-profiling of the released labor force.

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