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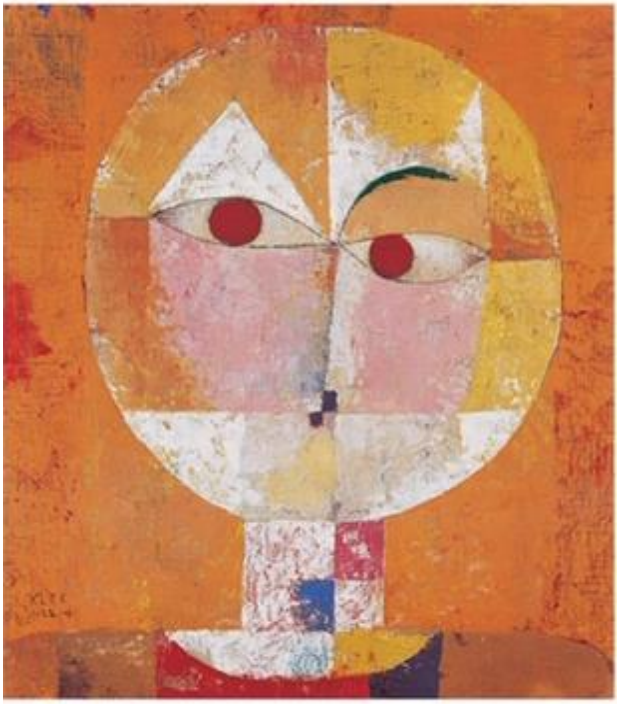

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Digital technologies as a logistics and supply chain management tool in economy

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Abstract

The study aims to investigate digital technologies as a logistics and supply chain management tool in the 21st-century economy via comparative qualitative research methods. As a result, the implementation of state-of-the-art digital technologies and the establishment of digital platforms in the member states of the Eurasian Economic Union will result in the realization of the competitive advantages. In conclusion, the digital economy fosters the establishment of information space, taking into consideration the needs of individuals and society in high-quality and reliable information.

Keywords: Digital, Platform, Logistics, Supply Chain, Management.

Las tecnologías digitales como herramienta de logística y gestión de la cadena de suministro en la economía

Resumen

El estudio tiene como objetivo investigar las tecnologías digitales como una herramienta de logística y gestión de la cadena de

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suministro en la economía del siglo XXI a través de métodos comparativos de investigación cualitativa. Como resultado, la implementación de tecnologías digitales de vanguardia y el establecimiento de plataformas digitales en los estados miembros de la Unión Económica Euroasiática resultarán en la realización de las ventajas competitivas. En conclusión, la economía digital fomenta el establecimiento de un espacio de información, teniendo en cuenta las necesidades de los individuos y la sociedad en la información de alta calidad y confiable.

Palabras clave: Digital, Plataforma, Logística, Cadena de suministro, Gestión.

1. INTRODUCTION

In the 21st century, the world economy is developing at an extraordinarily rapid pace, both in terms of quantity and quality. Manifestos exposing the latest development paths brought to the level of not only new paradigms but also industrial revolutions have been published in the original language at a six-year interval.

Previous industrial revolutions were considerably scattered over time and the intervals between them were much longer. The first industrial revolution (1760-1840) is usually associated with the invention of the steam engine and railroad construction, which laid the foundations for mechanical production. The second industrial revolution (late 19th – early 20th centuries), based on the spread of electricity and the assembly line, predetermined the emergence of mass production. The third industrial revolution, defined as the Computer Revolution, is traditionally divided into three stages: the use

of large-sized computers (1960s), the spread of personal computers (1970s-1980s) and the advent of the Internet (1990s-present).

American economist, environmentalist and author of the concept of the Third Industrial Revolution Rifkin has a different view on the above: I guess we are in the final stage of the industrial revolution and of the oil era based on it. It is difficult to accept this harsh reality, because, by recognizing it, humankind needs to immediately shift to a new energy regime and a new industrial model or get ready for the destruction of our civilization. Although we do not share Rifkin's pessimism in relation to the end of the oil and gas era, we cannot but agree with him in terms of the shift to a new industrial model. In our view, the new industrial model, or even the new industrial paradigm, is supply chain management, which serves as the main tool for transnational corporations (STOCK & LAMBERT, 2005).

2. MATERIALS AND METHODS

Supply chain management (SCM) is the process of coordinating and integrating the activities of supply chain participants, which carries out the inter-organizational coordination of all supply chain participants. In integral logistics, this function was the prerogative of logistic management, whereas cross-functional coordination has become - after logistics' inclusion into SCM - the area of prime

interest for supply chain management while remaining the responsibility of corporations' logistics management. According to the definition proposed to by the European Logistics Association, supply chain management (SCM) is an integral approach to business based on the fundamental principles of managing a logistics chain such as the formation of functional strategies, organizational structure, decision-making methods, resource management and the implementation of supporting functions, systems and procedures (GRIGORYEV ET AL., 2018).

A number of international researchers highlight that the use of the SCM paradigm is a specific response to the changing market conditions with regard to logistic requirements, strategic corporate development planning and effective short-time production control. The objective of SCM, i.e. high-quality goods delivery to the end consumer of a supply chain, can be achieved only through the implementation the above logistic patterns. In this regard, third-party logistics assumes a new importance, involving providers and logistic operators specialized in a wide range of logistic services. Third-party logistics is a major direction for the development of traditional warehouse and transport enterprises. In this case, a balanced system of logistics management indicators makes it possible to improve the functional activities of enterprise and to enhance the overall effectiveness of supply chains (BERGER ET AL., 2018).

Attention should also be given to the following consideration: a situation is possible when an a priori effective paradigm cannot absorb

all the tools necessary for its implementation and further coordination efforts are required, which badly affects the end result. On the contrary, the supply chain management paradigm is complimentary and designed to use large amounts of data and other new sources of information, new empirical approaches, analytical methods and innovative tools for theoretical and practical development. This fits in well with recent research on digital economy, Industry 4.0, 3D printing and so on.

Moreover, further development of supply chains with a view to digitize and use digital technologies is indicative of cardinal changes taking place throughout the production and service chain. The vertical network of intelligent productive systems and the horizontal integration of value-oriented supply chains lead to the formation of new conceptions of supply, production and sale logistics, based on the closely interconnected global logistics systems. In this context, the relation and interaction between logistics systems and technologies and the objective of Industry 4.0 require clarification.

Also noteworthy is Rifkin's observation that the communication revolution of the 1990s led to job creation and helped transform the economic and social landscape. The IT sector and the Internet, however, are not sufficient to bring about a new revolution. To achieve it, new communication technologies must merge with the new energy regime (SERGEYEV ET AL., 2008).

3. RESULTS

One of the highlights of Rifkin's research is the clear wording of the main areas to be modified: The third industrial revolution is based on five pillars: 1) a shift to renewable energy sources; 2) transformation of all buildings on each continent into mini power stations generating electricity where it is consumed; 3) use of hydrogen and other technologies in each building with a view to accumulating periodically generated energy; 4) use of Internet technologies to turn each continent's power system into an intellectual electric network ensuring the distribution of power in the same way as information is distributed on the Internet; 5) shift of the vehicle fleet to battery-powered cars rechargeable via the network or fuel cell cars.

In our view, these large-scale technological changes will require commensurate institutional transformations at the macro- and meso-levels as well as managerial transformations at a microeconomic level, which the above-mentioned work does not reflect adequately. Apparently, this circumstance has determined demand for and success of the fourth industrial revolution, articulated and exposed in the eponym research work of the Executive Chairman of the World Economic Forum (SCHWAB, 2017). Some examples of the areas in which technological breakthroughs have occurred include, according to SCHWAB (2017), the following: artificial intelligence, robotics, the Internet of Things, robotics, 3D printing, nanotechnology, biotechnology, material engineering, energy accumulation and storage and quantum computing.

In short, the focus is on the environmental and socio-economic implications of the implementation of economic limitations to technological progress. SCHWAB (2017) mentions the following factors to substantiate the independent nature of the fourth industrial revolution and its irreducibility to the stage of the third industrial revolution: Development rate. Unlike previous revolutions, this industrial revolution evolves at an exponential, rather than linear, rate. This is the creation of a multifaceted and interdependent world in which we live, as well as of the fact that the new technology synthesizes the latest and effective technologies all by itself. Width and depth. Based on the digital revolution, it combines various technologies that account for the emergence of unprecedented paradigms in the economy, business, society and every individual. Systemic impact. It implies comprehensive internal and external transformations of all systems to take place in all countries, companies, industries and society as a whole (GRIGORYEV, 2016; 2017).

SCHWAB'S (2017) focus on the digital revolution and the shift from postindustrial to digital economy is of special importance to our research. Digital technologies change both the nature of economy and its entire lifestyle. Digitization transforms the global logistics system into the self-service and cooperative economy and, in the final analysis, implies fundamental transformations that can develop into the category, which researchers define as business landscape (NIMEH ET AL, 2018).

4. DISCUSSION

Economic and social systems are constantly evolving as a result of changing social needs and demands. Various opportunities for the development of enterprises and of emerging economies arise with the development of new technologies, research projects and discoveries. As an example, sustainable urban development in emerging market economies fosters innovative research into current issues in response to new digital platforms, cooperative economy and other activities taking place in developing economies. The Digital Economy Program of the Russian Federation regards digital economy as a sphere, in which digital data are a key production factor in all socio-economic spheres, which strengthens national competitiveness and the quality of life of citizens and promotes economic growth and national sovereignty (PAULIENE ET AL, 2019).

Russian researchers have not yet sufficiently studied this category, despite its significance and scope. For example, the Big Russian Encyclopedia, the main Russian-language compendium of present-day knowledge, lacks entries such as digital economy and supply chain management, despite the fact this term was introduced back in 1995 by the American information scientist Nicholas Negroponte (Massachusetts Institute of Technology). Today, the term digital economy is widely used by economists, sociologists, politicians and journalists, although there is no generally accepted, coherent definition of this term. Doctor of Economic Sciences and Corresponding Member of the Russian Academy of Sciences Vladimir

Ivanov proposes a rather broad definition of the term: Digital economy is a virtual environment that complements our reality. It is also believed that the digital economy is a segment of economic relations mediated by the Internet and mobile communications. Generally stated, digital economy encompasses anything that can be formalized, i.e. transformed into logical schemes.

In our opinion, the digital economy is not part but a condition of manufacturing (big) economy. The digital economy comprises all phases of the production process and related spheres via state-of-the-art information technologies. The Digital Economy of the Russian Federation mentions the following main digital technologies to be implemented in digital economy:

- Big data;
- Neurotechnology and artificial intelligence;
- Blockchain technology;
- Quantum technology;
- New manufacturing technologies;
- Industrial Internet;
- Robotics and sensorics;

- Wireless technologies;

- Virtual and augmented reality technologies.

Uses of information technology – the ultimate expression of the digital economy – in logistics and, later, in supply chain management have been the subject of our research on many occasions.

In terms of logistics, which is an area of special interest for the authors, digital information technologies make it possible to considerably reduce transaction costs that account for a fair share of general logistic expenditure in supply chain and logistics systems. Transaction costs include the following:

- Costs related to decision-making, planning and organization of upcoming activities, negotiations over its content, terms and conditions, when two or more participants are involved in a business relationship;

- Costs related to adjusting plans, renegotiating deals and finding solutions to contentious issues, when necessitated by changing circumstances;

- Costs related to honoring the agreements reached by the participants.

Transaction costs also include any losses resulting from the following:

- Ineffective joint decisions, plans, agreements and created structures;

- Ineffective responses to changing circumstances;

- Ineffective protection of agreements.

Information resources are one of the major subsystems of a firm's resource capacity, and information is a key element of logistics operations. The information specifies the needs of logistic systems' entities and links in supply chains. The main objective of information exchange is to harmonize the demands of various subjects for order sizes, stock availability and resource velocity.

An information flow, being an integral part of a comprehensive logistic flow, should reflect correctly real practices in physical distribution, production and maintenance supply.

In our view, prospects of information logistics are bright, if only because the firm is, by definition, a system that requires interactions between its parts to create a complex and integrated whole. This is why an information flow system should provide information to all other logistics subsystems and ensure a feedback mechanism.

What follows is a simplified information logistic flow diagram showing the passage of main information flows necessary for the functioning of this or that entrepreneurial firm. In establishing the organization's objectives and tasks, its management system, i.e. the firm's management, takes into consideration internal capacities and the market environment.

From a traditional perspective, the main objective of any entrepreneurial firm is to make profitable products and to expand production. In this case, the management, including the technical and maintenance staff, could be reduced to the general manager who is the main decision-maker.

Previously, the vast majority of the firm's resources were supposed to be directed to production, i.e. human and material resources fully focused on supplying goods to consumers. Information costs aimed only at coordinating production processes were regarded as a sort of tax on productive operations. Besides, only recently has economic theory started to perceive information as a resource, together with land, labor and capital.

At the modern competition stage, however, the management had to change its perception of information. Production engineering has become more complicated, cross-firm competition has increased, the pace of scientific and technological development has speeded up and the nature of public management has changed. The involvement of new specialists to deal with arising issues had led to a considerable

increase in the number of management staff and to the emergence of new management levels and functions. Firms have started to employ specialists, functional and technical staff who merged with the management because their main task was to process information instead of manufacturing goods or providing services. Information, with which modern firms operate, has taken on a new significance. Neither subsystem of a firm can meet the efficient management requirements unless it can choose between options arising from the plethora of available information. This explains a considerable growth of economic and legal staff, of marketing and logistics experts. Such an evolution has posed a problem of organizing the volume of information work resulting from an increase in intra-firm interactions; the number of external economic ties has been growing quickly too.

Accordingly, it can be argued that the implementation of state-of-the-art digital technologies and the establishment of digital platforms in the member states of the Eurasian Economic Union will result in the realization of the competitive advantages included in the new entrepreneurial paradigm, i.e. supply chain management, and its key component, i.e. logistics (from now on, digital logistics). This approach will not only improve the performance of the Union's transport links, but also provide a framework for effective development of the entire economic sector of the Eurasian Economic Union.

5. CONCLUSIONS

The Digital Economy Program of the Russian Federation, guided by Russia's 2017-2030 Strategy for the Development of Information Society in the Russian Federation, presumes that the digital economy is an economic activity, in which the key production factor is digital data. Digital economy fosters the establishment of information space, taking into consideration the needs of individuals and society in high-quality and reliable information, the development of the informational infrastructure of the Russian Federation, the creation and application of Russian information and telecommunication technologies and the establishment of a new technological basis for social and economic sectors.

This Program contributes to the coordinated development of the digital economy in the member states of the Eurasian Economic Union and to the cooperation with its European and Asia-Pacific partners as part of the Shanghai Cooperation Organization (SCO) and BRICS.

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