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Implementation of Global Supply Chains as a Strategy for Increasing National Competitiveness

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Abstract— **Today competitiveness depends not only on price but also on customer service and delivery time. The creation of an effective infrastructure and the development of global supply chains is the key condition for increasing competitiveness. The study is based on the analysis of peer-reviewed literature, as well as the information publicly available on official websites. The purpose of the research is to conduct a thorough analysis and compare the level of competitiveness and efficiency throughout the supply chain of logistics services in different countries. The logistics efficiency and global competitiveness indicators have been analyzed. It has been concluded that favorable conditions in the country evidenced by its high ranking in the International Logistics Performance Index determine the potential for the implementation of global chains and provide opportunities for increasing competitiveness.**

Keywords— *supply chain, supply chain management, competitiveness, global competitiveness index, logistics.*

1.   Introduction

There is no doubt that over the past ten years, logistics and supply chain management has become increasingly transparent and legitimate at the global level. The development of technology and the growth of information and communication technologies have brought about changes in logistics and forced companies to change their approach to supply chain logistics. On the other hand, the current climate is characterized by new developments in logistics services and their transformation. Today competitiveness depends not only on price but also on customer service and delivery time. This can be affected by the implementation of modern logistics methods. Thus, logistics providers are seen as business partners, and relationships with a logistics company are referred to as partnerships on the global market. The development of information and communication technologies has contributed to the popularity of electronic logistics that provides a methodological basis for the information exchange and ensures transparent partnerships in supply chains.

Supply chain management is associated with the management of all activities within a business network aimed at providing goods or services to end users. The effectiveness of these measures can have a serious impact on customer satisfaction and cost reduction. Due to the fact that global supply chains cross a number of regulatory boundaries, firms are experiencing increasing consumer and government pressure to take responsibility for social and environmental issues that go beyond the scope of their immediate organizational boundaries. Therefore, mechanisms for managing global supply chains are faced with the requirements of production and consumption sustainability.

The creation of an effective economic infrastructure is currently the key condition for increasing the international competitiveness of middle-income countries seeking to bridge the development gap. Nationally, investments in digital economy can be a tool that supports sustainable development and accelerates the convergence process at the regional level. In this context, comparative studies of the developments in logistics services and their transformation in the digital economy environment should be considered as an urgent and important scientific task.

2.   Literature review

Supply chain management issues have been studied by a number of researchers and affect sustainable management [1], globalization of supply chains [2],

and adaptability [3]. The study [1] considers the role of management accounting in sustainable supply chain management and the relationship between sustainable supply chain management and efficiency, including financial and environmental factors. The research is based on a questionnaire; the results of the analysis indicate that sustainable supply chain management has a positive effect on both financial and environmental efficiency.

The introduction of sustainable supply chain management was proposed in [4]; however, it is noted that global supply chains pose unique challenges. The purpose of the study [4] is to summarize key management elements in global supply chains. In [5], it is highlighted that a number of modern supply chains are decelerated and lag behind due to the rooted manual processes and disconnected corporate systems [5]. Over the past few decades, the rapid development of data collection, monitoring, disclosure and dissemination has contributed to the development of completely new techniques to manage the sustainability of global supply chains [6].The purpose of the research [7] is to study the management problems of global supply chains and networks, as well as to introduce sustainable management.

Globalization of supply chains complicates their management. The study [2] considers the application of blockchain technology and smart contracts to manage supply chains from the critical perspective. The authors of [8] provide recommendations for future research in global supply chain modeling and demonstrate a pronounced practical focus. Although an adaptive supply chain is an integral part of winning manufacturing strategies, it is not clear how firms create an adaptive supply chain in global production networks [3]. The research [3] is an empirical study that identifies key variables for implementing a successful supply chain.

The SCOR (Supply-Chain Operations Reference) model [9] has been designed to evaluate and compare the activities and effectiveness of the supply chain. It combines business processes, indicators, best practices and technologies into a unique single structure to support supply chain partnership and increase the efficiency of supply chain management and related activities aimed at the supply chain improvement.

The study [10] examines the impact of supplier innovation on collaboration and supply chain flexibility. The results show that supplier innovation has a positive effect on information exchange and supply chain flexibility, but does not have a significant relationship with strategic supplies [10]. In [11], it is emphasized that supply chain management is not a series of actions; this is a complex process that considers the organization and management of all supply chain activities from an integrated perspective in order to ensure a competitive advantage. Supply chain efficiency has

also been considered in [12]; the study discusses the advantages of horizontal and vertical clusters through the example of China.

Digital technologies have dramatically changed almost every business. The researchers [13] note that enterprises cannot unlock the full potential of information technology if their supply chains are not digitalized. Potential problems, trends, and strategic goals in production management, as well as the application of innovative approaches in the current and future practice of digital transformation of supply chains are discussed in [13]. Internet technologies allow companies to provide their customers with an opportunity to interactively configurate settings. In addition, many researchers note that in the last few years a new type of supply chain management problem caused by digital transformation has arisen [14, 15]. This includes, for example, dynamic pricing that depends on the decisions on stocks and capacities. Another example of new challenges due to the active introduction of information and communication technologies is the coordination of Internet channels and traditional distribution channels in terms of prices, as well as information and product flows. Moreover, electronic trading platforms and auctions have caused a number of new problems related to procurement and relations with suppliers [16].

2.2 Problem Statement

Competitiveness is a multidimensional and dynamic category which is the key driver of market economy and economic development. There is a close relationship between the issues of sustainable economic growth maintenance and constant improvement of national competitiveness. The logistics environment is becoming more complex due to the globalization and market segmentation strategy. A global supply chain is a dynamic worldwide network where companies buy or use goods and services from abroad. It consists of people, information, processes and resources involved in the production, processing and distribution of materials and finished products or the provision of services to a client.

In modern economy, supply chains are the key distribution channels that expand international trade flows contributing to global trade. A supply chain affects any activity that delivers value to customers; thus, it has an impact on the vast majority of functions within the company. Firms no longer consider a supply chain as support for the business; it has been classified as business driver.

The purpose of the present study is to assess the capabilities and development of supply chain management systems in terms of creating conditions for being incorporated in global supply chains in the context of increasing national competitiveness. Thus, to assess the potential and efficiency of supply chain management, logistics efficiency and national competitiveness should be evaluated; this will determine the effectiveness of the global supply chain implementation strategy.

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3.   Methods and materials

A lot of international organizations, research groups, as well as individual researchers analyze the issues of assessing and increasing international competitiveness [17-19]. There are various approaches to assessing competitiveness (for example, the Global Competitiveness Index [18]). Meanwhile, there is no common definition of international competitiveness and a comprehensive system of indicators defining the phenomenon. The purpose of the research is to conduct a thorough analysis and compare the level of competitiveness and efficiency throughout the supply chain of logistics services in different countries.

Competitiveness is assessed based on the Global Competitiveness Index (GCI), which reflects the factors determining the level of productivity and long-term economic growth [18, 19]. The GCI analyzes competitiveness by various pillars, including: institutions, infrastructure, information technology, market size, etc. In terms of assessing the possibility of global supply chain implementation, infrastructure and information technology factors are of most interest.

The logistics infrastructure efficiency is measured based on the Logistics Performance Index (LPI); it is used to measure efficiency throughout the supply chain of logistics services [20]. International LPI is a summary indicator of the performance of logistics sector. Unless some respondents provide information on all components, interpolation is used to fill in the missing values [20]. Missing values are replaced by the national average based on the average deviation of the respondent. Thus, International LPI allows analyzing different countries with incomplete data.

The study is based on the data of companies that have developed the competitiveness indicators of countries, as well as an International LPI. All information is publicly available on official websites [17, 19, 20]. The analysis was conducted based on 2012-2019 statistics [21-23]. The statistical analysis is performed in Microsoft Excel. The selection of countries for comparative analysis is based on the principle of choosing states with higher and lower ranks.

4.   Results

First, let us select the most competitive countries according to the GCI. The top ten countries include USA, Singapore, Germany, Switzerland, Japan, Holland, Hong Kong, Great Britain, Sweden and Denmark. The GCI 4.0 [19] defines competitiveness as the economy features which allow more efficient use of production factors. This concept is based on growth accounting which measures the contribution of production factors, that is, labor and capital, and the total factor productivity which measures factors that do not depend on labor or capital [19]. Next, let

us consider countries with the lowest GCI ranks: Honduras, Tajikistan, Bangladesh, Bolivia, Ghana, Pakistan, Rwanda, Nepal, and Cambodia; they are ranked in the second hundred of the ranking list.

In order to form groups of countries for the descriptive analysis, let us expand the list of the selected countries with those that occupy high (top ten) and low ranking positions in the LPI. In addition, let us note the ranks of the previously selected countries in the LPI. The top ten countries also included Belgium, Austria and Finland while the United States, Switzerland and Hong Kong are ranked a bit lower. The group of poorly competitive countries demonstrates a relatively similar result in the LPI; however, they are more dispersed across the list. The only exception is Rwanda, which ranks 57th in the LPI. Thus, it is not feasible to expand the second group of countries (low-ranked ones). Table 1 shows the positions of the countries in two rankings.

Table 1. The ranks of countries (fragment) in the GCI and LPI (based on [19, 20])

Country	GCI score	GCI rank	LPI score	LPI rank
Austria	76.33	22	4.03	4
Bangladesh	52.07	103	2.58	100
Belgium	76.61	21	4.04	3
Bolivia	51.39	105	2.36	131
Great Britain	81.98	8	3.99	9
Ghana	51.33	106	2.57	106
Germany	82.83	3	4.20	1
the Netherlands	82.37	6	4.02	6
Honduras	52.46	101	2.60	93
Hong Kong	82.25	7	3.92	12
Denmark	80.62	10	3.99	8
Cambodia	50.18	110	2.58	98
Nepal	50.78	109	2.51	114
the United Arab Emirates	73.37	27	3.96	11
Pakistan	51.08	107	2.42	122
Rwanda	50.93	108	2.97	57
Singapore	83.47	2	4.00	7
the USA	85.64	1	3.89	14
Tajikistan	52.17	102	2.34	134
Finland	80.26	11	3.97	10
Switzerland	82.58	4	3.90	13
Sweden	81.65	9	4.05	2
Japan	82.46	5	4.03	5

As is evident from the foregoing, most competitive countries occupy similar positions in the Logistics Performance Index. At the same time, low-ranked countries being at the bottom of the LPI demonstrate a higher dispersion rate across the list. Let us consider the

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components of the indices in more detail.

Transparency aggregates data from a number of different sources that provide business people and experts with the insight on the level of corruption in the public sector. More detailed information on the methodology can be found in [23]. According to experts and businessmen, the index assesses 180 countries and areas by their estimated level of corruption in the public sector. The analysis shows that corruption is more common in countries where big money can flow freely into electoral campaigns and where governments listen only to the voices of wealthy and well-connected people [23]. Figure 1 shows the index scores for the selected countries. It can be observed that highly competitive economies are also the most transparent countries while poorly competitive states are characterized by high corruption rates, which may hamper their economic development. The only exception is Rwanda, which ranks 55th in the CPI.
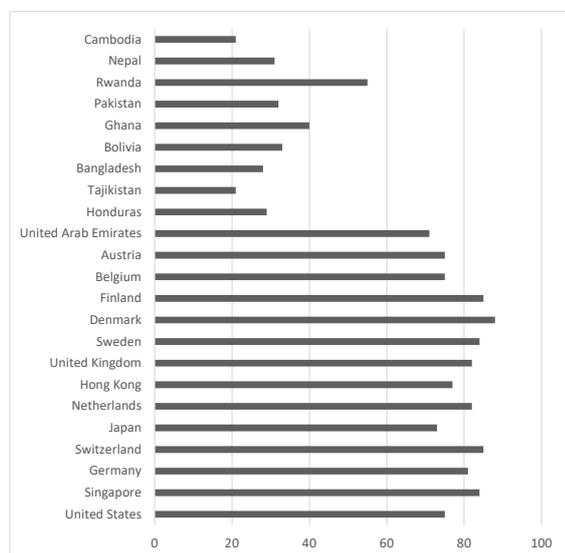
Figure 1. Transparency rate based on [23]

The Global Competitiveness Index consists of a number of sub-indices; Infrastructure and the Adoption of Information and Communication Technologies (ICT) are of particular interest as factors that encourage the development of global supply chains. Infrastructure involves the quality and expansion of transport infrastructure (road, rail, water, and air) and communal infrastructure [19].Geographical areas with better connections tend to be more prosperous. A well-developed infrastructure reduces transport and transaction costs and facilitates the movement of goods and people and the transfer of information within and outside the country. It also provides access to electricity and water that are important for modern economic activity.

The adoption of ICT reflects the degree of diffusion of specific information and communication technologies in the country [19]. ICTs reduce transaction costs and accelerate the exchange of information and ideas increasing

efficiency and stimulating innovation. ICTs are general-purpose technologies that are increasingly being introduced into the economy; they are becoming as important as the energy and transport infrastructure. Figure 2 shows the sub-index scores for the selected countries. We should note that most selected countries demonstrate a similar score.
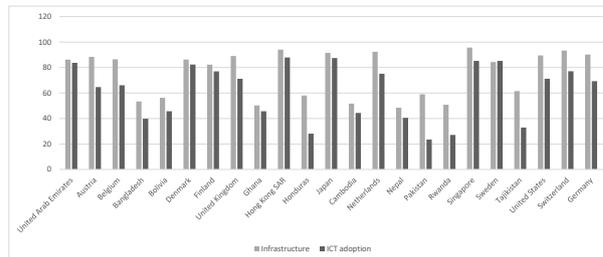
Figure 2. Infrastructure and ICT adoption in the GCI (based on [23])

Let us consider the Logistics Performance Ranking. The Logistics Performance Index (LPI) is a benchmarking tool designed to help countries identify the challenges and opportunities that they face in their trade logistics activities and what they can do to improve their performance [20]. The LPI compares 160 countries and helps build profiles of logistic friendliness of these countries. Figure 3 shows the LPI scorecards of some countries.
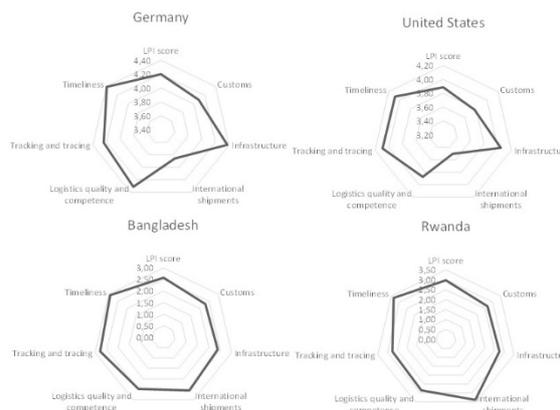
Figure 3. The LPI scorecard: Germany, the USA, Bangladesh, Rwanda (based on [20])

Thus, it can be concluded that a well-developed infrastructure and the active introduction of ICTs set the stage for the development of domestic supply chains, as well as the globalization in supply chain management. The analysis shows that high logistics performance scores contribute to the economic growth and increased competitiveness of countries.

5. Discussion

The issues related to the research on supply chain management involve the concepts and problems that are associated with the study of efficiency, sustainability and adaptability, as well as a number of new problems that have arisen as a result of the development of electronic forms of communication and doing business.

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There are issues related to supply chain management [1, 6, 8] and the specifics of the implementation of information technologies [2, 5, 24, 25].

According to [26], it can be noted that the search for the sustainability factor in supply chain management should consist of several stages: 1) material collection; 2) descriptive analysis; 3) category identification; 4) material evaluation. Thus, available research papers can be classified into conceptual, qualitative, quantitative or mixed studies. Research that is based on quantitative, qualitative, or mixed empirical data analysis is the most common in the literature. A systematic review allowed the researchers [4] to conclude that configurations and management mechanisms are the key elements of effective supply chain management.

The study [27] introduces a research model that defines the drivers, strategy and methods of an adaptive supply chain. The research shows that the key factors affecting the degree of the implementation of an adaptive supply chain strategy are mainly the size of firms, industry characteristics, customer and supplier databases rather than the location of manufacturing facilities. It is described [3] that an effective implementation of the adaptive supply chain strategy includes the integration of inter-organizational resources throughout the global supply chain to expand production management capabilities.

Supply chains are gaining currency in a number of companies due to globalization; production does not depend on a particular geographical location, but firms should increase their efficiency and strive for better relations with their suppliers and customers in order to ensure the flow of goods to the final consumer [26, 27]. Global competition is being shifted to supply chains and their management; however, supply chains are focused exclusively on the economy and neglect environmental and social factors. Thus, it is important to be able to show the advantages of a sustainable supply chain. The study [8] considers decision-making models for designing global supply chains and assesses the correlation between research literature in this area and practical issues of global supply chain designing. The researchers [8] conclude that although most models provide a complex function related to globalization, only a few models can completely solve the practical problem of designing a global supply chain.

As has already been noted, global competition is focused on supply chains and their management. The study [12] demonstrates that the provision of business-friendly services based on the synergistic advantages of vertical and horizontal integration of supply clusters contributes to the competitiveness of the region. In addition, it was found that specialized markets and international traders play an important role in the sustainable development of clusters [12].

The research results [15] show that the use of an advanced logistics operator can help companies increase their competitiveness in the modern market.

The researchers of [15] concluded that customer experience, new participants, technological cooperation and competition are the major characteristics of the new trend, and logistics service providers will have to adapt to these changes.

The demonstrated analysis of indices indicates a significant relationship between the degree of development of the logistic environment and the socio-economic development of the state. The formation of models applicable to the least and most competitive markets opens up the possibility of developing mechanisms for transition economies (for example, Russia and Azerbaijan). The peculiarity of Azerbaijan as a participant in global supply chains lies in its role as a commodity supplier, while Russia is primarily focused on the provision of services with respect to commodity positions, which creates a wide variation in the role of such participants in the chain. To build effective systems for managing global supply chains, it will be necessary to adapt the above-demonstrated tools to the realities of transition economies (including the regulatory infrastructure formed even under the administrative-command system). The raw material context of the economies of Russia and Azerbaijan, that is, dependence on global energy markets, also opens up the need for permanent control over the financial feasibility of operations, which significantly transforms management tasks and areas of responsibility within the supply chain. The study will become the basis for the development of applied models for the effective coordination of global supply chains, where there are participants representing various types of economies, which will be the subject of further research.

6.   Conclusions

Global supply chains are becoming increasingly important as they provide a lot of additional opportunities created by foreign customers and suppliers, as well as the impact created by foreign competitors. Foreign competitors operating in the domestic market can significantly affect the activities of companies that do not sell internationally. Thus, managing these potential opportunities and threats is critical to a successful business. The present study considers the global supply chain from a general perspective while any company can globalize its supply chain or certain processes within it. As a result, companies can increasingly develop horizontal partnerships to add value to products or services in contrast to vertical integration Thus, as the Internet and digital economy expand, the concept of a separate transaction made by electronic means with a network of companies regardless of country and geographical boundaries becomes a rational proposal at each stage of the value chain.

However, at the same time, less developed countries are experiencing problems related to economic and information technologies which should be solved by global businesses and supply chain management. It can be concluded that favorable conditions in the country evidenced by its high ranking in the International

Logistics Performance Index determine the potential for the implementation of global chains and provide opportunities for increasing competitiveness.

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