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KAZAKHSTAN'S TRANSIT POTENTIAL DEVELOPMENT THROUGH TRANSFORMATION OF LOGISTICS PROCESSES AS A PART OF ECONOMIC GROWTH

The rapid development of transport, the widespread introduction of modern transport technologies, close cooperation with Russia, China and other neighboring countries, will allow Kazakhstan to become a serious player in the transportation market between Europe and Asia in the coming years. Such existing transport potential directly affects the economic growth of the country which will lead to high living standard. The global movement towards digitalization is transforming the logistics industry, as well. The "digit" changes the channels of movement of goods, delivery formats and management processes. Development of e - commerce and the increasing supply requirements - multichannel, responsiveness, transparency, accuracy - stimulate retailers and logistics operators to increase efficiency of processes and introduce new technologies. Therefore, the ways of prosperity of Kazakhstani economy, through digitalization of logistics processes is considered in this article.

Keywords: *digitalization, transit potential, logistics operations, economic growth, e - commerce, innovations, new technologies*

1 Introduction

The demand for transit services is constantly growing, and accordingly, the market for these services is expanding. In the first approximation, the volume of transit traffic directly depends on the number of countries in the world, volume of the world trade, share of products with a high degree of processing in it and, conversely, on share of the transport costs in the cost of the transported goods.

For countries that provide transit services, like Austria, Hong Kong, Singapore, Ukraine, this is a kind of "invisible" export, which in some cases brings the state income. According to the World Trade Organization data for 2013, the share of transport services in the world trade in goods and services was 4.8% in exports and 5.2% in imports [1]. Of course, transit is only one of components of both export and import of transport services. Cargo and leasing vehicles, provision of repair and bunkering services, transportation on national vehicles between third countries, etc. occupy a significant share. However, transit countries can provide up to half of the revenue from international transport services.

The economic significance of transit is not limited to balance of income and expenditure of countries on transit operations. Its volumes reflect the level of transport development and its international competitiveness, which is important for the national economy. This is closely related to activities of related industries: insurance, logistics, energy, etc. Transit attractiveness of communications is an important factor in development of the neighboring regions. In this sense, the volume of international transit traffic is an indicator of the development level of transport and logistics, national rules governing the transit transport.

Countries seek to benefit from transit by offering new options for international transport through their territories or by improving the quality of transit services, primarily by speeding it up and improving the safety of goods in transit, as well as for passengers, which makes travel more comfortable. For this purpose, new transport routes are created and upgraded, new transport technologies are introduced, preferential tariffs are provided. The competition of transit routes largely regulates tariffs and simplifies transit rules.

Development of transit today is due not so much to peculiarities of the transport and geographical position of the world countries and the geography of their foreign trade, but to the pace of introduction of modern transport and logistics technologies. The second half of the last century and the beginning of the new century were marked by unprecedented technical progress in the main types of international transport, which significantly changed the overall picture of the world economy. The global economic space has become more accessible and convenient for development and profitable use.

Thus, at the same time, there is a desire in the countries of the world to reduce transit dependence, increase revenues from international transit, and use it

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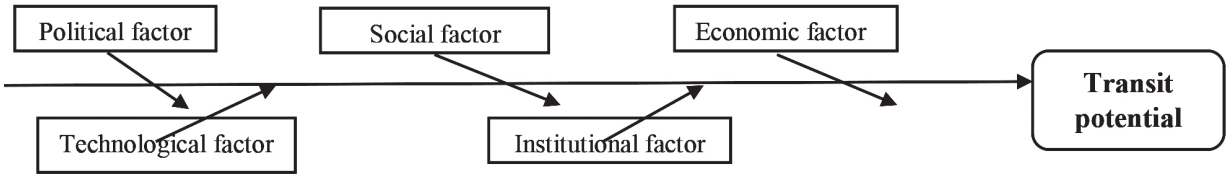

Figure 1 *Factors that affect country's transit potential*

Table 1 *Logistics 4.0 technologies and systems*

Title of the technology/system	Main function
RFID: Radio - Frequency Identification Systems	Identification
Real time locating systems	Locating
CPS: Cyber Physical Systems	Sensing
IoT: Internet of Things	Networking
Big Data and Data Mining	Data Collecting and Analyses
IoS: Internet of Services	Business Service etc.
AGV: Automated Guided Vehicles	Material handling
WMS: Warehouse Management Systems	Support and optimization of warehouse functionality and distribution center management
TMS: Transportation Management Systems	Optimization of freight shipping process
Blockchain Technology	Record transactions
E - Marketplace (Freight Exchange) Platforms	Access to interact and exchange business
Autonomous Vehicles and Routes	Transportation
Active Communication and Agility	Effective interaction
Ambient Intelligence	Sensor networking
Innovative Horizontal Loading Technologies	Co - loading shipment

widely to speed up the international transport and increase their reliability, while increasing competitive delivery route options. These trends make up a rather ambiguous picture of the transit development in the countries of the world, including Kazakhstan.

In the World Bank's logistics efficiency Index (LPI), Kazakhstan is taking the 71st place among 160 countries in 2018, which is 6 positions higher than in 2016, ahead of the member countries of the Eurasian economic Union. Significant improvements were made in two LPI indicators - "efficiency of the customs clearance process" and "Timely delivery of goods". At the same time, it should be noted that Kazakhstan has not yet fully used the potential, including international, of the country in the field of transport and logistics.

The transport industry is one of the most important sectors of Kazakhstan's economy: its share in the GDP structure in 2018 was 8.4%. The volume of cargo transported by all the modes of transport has doubled - from 1.9 billion tons in 2007 to 4.1 billion tons in 2018. The cargo turnover increased 2.2 times - from 263.6 billion to 596.0 billion tons/kilometers, an average of 5.3% annually. The observed trend indicates the most important socio - economic role of the transport industry in the development of the Republic. Moreover, today the salary of an employee in the field of transport and storage is higher than the national average by 40 thousand tenge and more.

The economic condition of Kazakhstan can be significantly improved by means of transport operations through the country. Currently, Kazakhstan can offer all the types of transport (rail, road, water, air and pipeline transport) for international transit, but many factors affect the transit potential. These are the main factors: political, social, economic, technological, and institutional (Figure 1).

Digitalization is the most relevant tool for technological development. The logistics industry is becoming one of the drivers of digitalization. One needs to master current delivery channels and formats, analyze big data, automate processes and implement block chain and robots.

All of the ideas, related to the technological development in major spheres, came with introduction of Industry 4.0. Industry 4.0 is a philosophy that integrates of all the value - added functions through the supply chain by using digitalization. Its key components are: Cyber Physical System (CPS), Internet of Things (IoT), Internet of Services (IoS) and Smart Factory. Therefore, logistics, as a part of supply chain, has its own similar system logistics 4.0, which shares same aims as Industry 4.0. Logistics 4.0, sometimes called Smart Logistics, is a system conversion from hardware - based operations to software - based operations. Its technical components and key elements include: Automatic Identification, Real Time Locating, Smart Sensing, Networking, Data Analyzing,

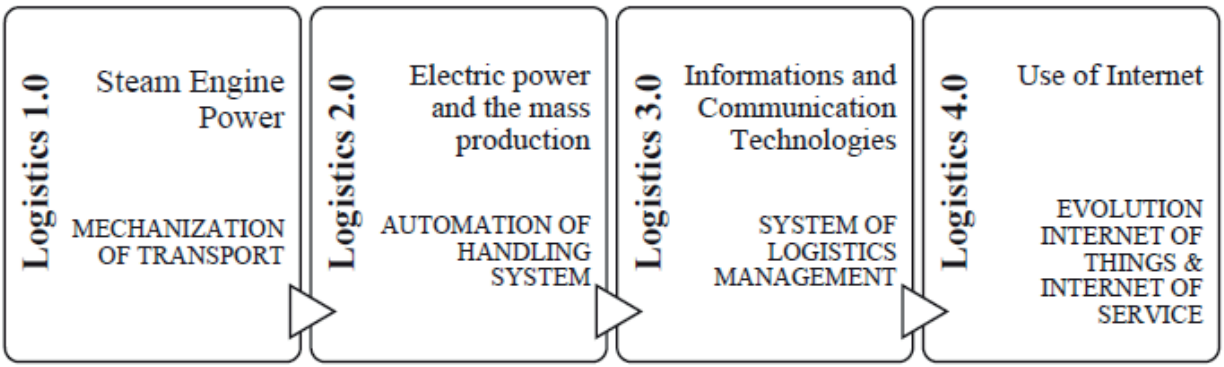

Figure 2 *Evolution of logistics [5]*

Internet for Business Services, Digitalization, Transparency, Automation, Modularization and Transportation and Distribution. All of the activities, done by the virtue of Logistics 4.0, are implemented in the area of Logistics Center 4.0. The main technologies and systems included in Logistics 4.0, which help to optimize logistics operations and minimize utilized time and expenditures, can be seen in Table 1.

2 Literature review

The transformations due to Industry 4.0, including operational, technological and social dimensions, not only affect manufacturing industries but also elements of the entire supply chain [2]. As one of the foremost critical components of supply chains, logistics operations are too anticipated to be influenced by characteristics of Industry 4.0, e.g. IoT, Cyber Physical Systems (CPS), Big Data and smart sensors [3]. Smart logistics or, as in used in this study, Logistics 4.0 can be defined as networking the whole supply chain through information technologies (IT), where high technological sensors and advanced robotics are used in operations [4]. Several key elements of logistics, including warehousing, handling, transportation, distribution and information services, have been forced to change by technological developments to increase efficiency [3].

Industry 4.0 affects logistics at both operational level and through broader concepts like Logistics Centers (LCs). Freight villages, distribution centers, dry ports, inland and intermodal terminals and logistics parks or nodes are several terms at different operation levels that are used in different countries and regions to describe Logistics Centers [5].

Logistics operations, such as transportation, warehousing and distribution, have confronted several changes in world trade history. All subsystems are affected by developments like industrial revolutions, new technologies, transitional concepts and business services. As shown in Figure 2, Logistics 4.0 is one of the fields influenced by the Industry 4.0 paradigm [6].

Multimodal transportation is generalized and intermingling concept that incorporate combining to utilize several transportation modes (air, rail, truck etc.) to transport of people or cargo [7]. In addition, since multimodal transport has some disadvantages and it is necessary to solve these problems, there is a need for new concepts of synchromodality, where a new solution towards more flexible and integrated freight transport has been implemented [8]. Vural [9] defined synchro - modality ensures efficient operations, so in short, LCs creates an integrated transportation infrastructure. In other words, from carriers to operators, all different stakeholders can easily evaluate the pros and cons of supply chain process by using the synchro - modality [10]. Moreover, the synchro - modality system facilitates supply chain optimization by considering all the transportation modes and relevant activities to access environmental, low risk and low cost - oriented approach and helps to stakeholders to organize best multimodal options and schedules strategically and to manage dynamic solutions for a quick fix demands operationally [11]. The new technological developments of logistics through Industry 4.0 are expected to alter LCs' operations including handling, warehousing, distribution and transportation, where smarter systems are needed [12].

From their compilation of relevant studies, Szymanska et al. [13] defined Logistics 4.0 within two approaches: (1) processual, meaning to increase supply chain members' efficiency and performance; (2) technical, which includes elements of Industry 4.0, such as digitalization, automation, mobility and IoT. Domingo Galindo [6] identified that, in general, Logistics 4.0 or Smart Logistics is a system that uses technological changes to improve flexibility and customer satisfaction, optimize logistics activities and adapt to global changes under the umbrella of Industry 4.0. One of logistics' primary objective is increasing capacity usage and using autonomous processes like high level of mobility, modularity, compatibility, communication and information in logistics facilities [14].

Tang and Veelenturf [15] summarized advantages of advanced technologies of Industry 4.0 on the logistics functions as: (1) faster speed by delivery services conducted by drones and delivery robots, (2) higher reliability by storage and retrieval systems using robots, (3) lower operating cost by inventory monitor and replenishment systems using smart sensors, (4) improved efficiency by container shipping enabled by block chain technology.

Table 2 *Multiple regression model*

Regression statistics					
Multiple R	0.870328				
R - squared	0.757471				
Normalized R - squared	0.65353				
Standard error	0.013516				
Observations	11				
Analysis of variance	df	SS	MS	F	Significance F
Regression	3	0.003994	0.001331	7.287518	0.014728
The remainder	7	0.001279	0.000183		
Total	10	0.005273			
	Coefficients	Standard error	t - statistic	P - value	
Y intersection	0.060792	0.021513	2.825818	0.025559	
Variable X_1	1.11E-08	2.49E-09	4.451192	0.002967	
Variable X_2	-4.3E-08	3.1E-08	-1.38641	0.208174	
Variable X_3	-8.7E-08	1.9E-08	-4.58774	0.002521	
Display residue				Conclusion of probability	
Observation	Predicted Y	Remains	Standard remains	Percentile	Y
1	22754491.47	13244533.63	0.847254674	8.333333333	4697115
2	36923807.69	2752025.208	0.176047439	25	35999025.1
3	35981100.54	4903033.061	0.313647713	41.66666667	39675832.9
4	35713580.29	-31016465.29	-1.984127636	58.33333333	40884133.6
5	48421741.43	5957116.371	0.38107757	75	54378857.8
6	57659779.38	4159757.022	0.26610024	91.66666667	61819536.4

Table 3 *Values of indicators, 2008 – 2018*

Year	GDP growth (real), %	Annual GDP, mln tenge	Investments in transport and storage, mln tenge	Gross output of transport services, mln tenge
2008	0.033	16052919.2	754359	2052517
2009	0.012	17007647	967724	2123850
2010	0.073	21815517	734505	2531615
2011	0.075	28243052.7	896323	2903264
2012	0.05	31015186.6	1038745	3439516
2013	0.06	35999025.1	1453656	4004633
2014	0.043	39675832.9	1192640	4600380
2015	0.012	40884133.6	1138572	5100619
2016	0.011	46 971 150.00	1176239	5898485
2017	0.04	54 378 857.80	1262907	6474355.567
2018	0.041	61819536.4	1453136	7522986.872

Faced with a challenge of Industry 4.0, logistics must adapt to new developments or needs, such as IT communication, production technologies, digitalization, big data usage, IoT, robotics and automation and RFID technologies. These would have both positive effects, such as high standardization, reduced labor force, more intelligent and transparent processes and negative effects, such as higher investment and infrastructure costs [13]. If an efficient, robust Logistics 4.0 system is desired, resource planning, warehouse and transportation management systems, intelligent transportation systems, and information security should also be considered [16].

In parallel with Industry 4.0's developments or changes, as in the logistics sector in general, LCs ought to adjust

Table 4 *The SWOT analysis of introduction of logistics processes digitalization to improve the economic growth*

Strengths	Weaknesses
- Contributes to GDP growth in all the existing Kazakhstan regions; - Significant replenishment of Kazakhstan's budget; - Increase of strategically important partner countries; - Fast and cheap delivery of oil and gas to processing points is possible by choosing the optimal transportation route; - Better order tracking and payment services; - High profit and service quality; - High volume of freight forwarding; - Customer satisfaction through brand new services.	- Requires significant time - period and high expenditures of maintenance; - Technological and innovation factors are poorly developed in Kazakhstan; - Sharp lack of local specialists in digitalization sphere; - Lower customer service costs; -Failure of critical IT systems.
Opportunities	**Threats**
- Simplification of internal processes with wider application of digital solutions; - With further development of the transport and logistics infrastructure, the country's GDP, due to cargo transportation in the Republic of Kazakhstan, will grow at least annually by 4.5 -5% over the next 5 years; - The process of increasing the efficiency of transport infrastructure facilities by 2-3 times can be facilitated by the introduction of innovations in automobile and railway communication in such large cities as Nur - Sultan, Almaty and Shymkent; - Reducing the negative effect of the lack of qualified specialists; - Quicker coordination with importer or exporter countries (clients); - Attracts investments, while financial markets encourage pioneer innovators with unprecedented high value for their business.	- Difficult task of involvement of specialists with knowledge in the field of digital technology; - Lose of competitive advantage due to alternative transit countries as Russia, Kyrgyzstan, Uzbekistan, Tajikistan, etc.; - Threat of the unemployment increase on the labor market; - Risk of brain drain to more technologically advanced countries; - Inability to keep up with pace of change and technological advancement; - New technologies obsolescing existing transport infrastructure.

themselves to survive since they are significant logistics sector components in terms of their key role in local and global operations. To succeed, they must keep abreast of Industry 4.0 elements and brace themselves to adapt the new paradigm [17].

3 Methodology

The methodological approach of this article includes both statistics research and regression analysis to identify the role of logistics in economic growth and how digitization of logistics operations affects the whole logistics sphere in the country. Based on 2008 - 2018 data of dynamics of the logistics operations investment and Kazakhstan's economy, their relationship is the regression analysis, reflecting the internal relationship between the growth of logistics and economic growth. Calculation of values of the regression equation coefficients (Table 2) was carried out using the tools of the "Data Analysis" task in Microsoft Excel in two stages with neglecting the insignificant variables from the equation.

Regression analysis is a statistical analytical method that allows to calculate the estimated relationship between a dependent variable of one or more independent variables. Regression analysis uses the chosen estimation method, the dependent variable and one or more independent variables to create an equation that estimates the values of the dependent variable. The regression model includes output, such as R^2 and p - values, from which one can understand how well the model estimates the dependent variable.

Regression analysis is modeled based on the Least Squares Method (OLS), a form of multiple linear regression, assuming that the relationship between dependent and independent variables should be modeled by fitting the linear equation to the observational data. The OLS uses the following equation:

$$y_i=\beta_0+\beta_1x_1+\beta_2x_2+...+\beta nx_n+\varepsilon, \quad (1)$$

where: y_i - observed value of the independent variable at point i, in this case, GDP growth,
β_0 - y - intercept (segment on the coordinate axis, constant value),
β_n - regression coefficient or slope of the independent variable N at point I,
x_n - value of variable N at point i, in this case:
x_1 - Annual GDP (at the rate 1KZT = 376.16USD for 21.02.2020) [18],
x_2 - Investments in foxed capital: transport and storage,
x_3 - Gross output of transport services,
ε - regression equation error.

To create the regression model, the GDP growth indicator from 2008 to 2018 years was taken as an independent variable and indexes of annual GDP,

investments in fixed capital: transport and storage, gross output of transport services of same years were taken as explanatory variables (Table 3). The statistic numbers were taken from the national statistics website stat.gov.kz [19].

Using the data from the above table to perform the multiple regression analysis, all the selected variables are forced into the regression, the economic growth rate as independent variable, annual GDP, investments in fixed capital: transport and storage, gross output of transport services as explanatory variables, sample period of 2008 - 2018, then the regression equation is:

$$y = 0.060792 + 1.11E\text{-}08\ x_1 - 4.3E\text{-}08\ x_2 - 8.7E\ - \\ - 0.8\ x_3 + 0.013516. \quad (2)$$

Calculation of indicators for assessing the significance of the obtained model and its parameters was carried out using the "Regression" tool of the "Data Analysis" task of MS Excel.

The statistical significance of the regression equation was estimated using the Fisher F - test. Actual value of F - Fisher test: F = 7.287. The table value of the criterion at a five percent level of significance and degrees of freedom = 3 and = 11-3 - 1 = 7 is Ftable = 4.35. Since F = 7.287 > Ftable = 4.35, the regression equation is recognized as statistically significant.

The statistical significance of the regression and correlation equations parameters was estimated using t - student statistics and by calculating the confidence interval of each of the parameters. The tabular value of the t criterion for the number of degrees of freedom 7 and significance level $\alpha = 0.05$ is t - table = 2.365.

Residual variance per degree of freedom is calculated by the formula:

$$s^2 \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n - 1}, \quad (3)$$

then: $S^2e = 0.000183$.

Square root of residual dispersion (standard error): S.e. = 0.013.

To identify measurements of significant and non - significant variable the following formula is used:

$$t = \frac{|\bar{x} - m|}{s/\sqrt{n}}. \quad (4)$$

In the regression equation, F (7.287) passes the test and the regression effect is significant, which shows that independent variable (the growth of logistics) has a higher interpretation to explanatory variable (economic growth rate), with general linear. In the interim, the determination coefficient $R^2 = 0.757471$ is quite high in the regression equation, indicating that Kazakhstan's economic growth depends on logistics operations.

4 Discussion

In methodology we used multiple regression analysis model to identify the relationship between GDP growth and growth of logistics operations, which shows the important role of transit potential in overall economic growth of the country. The main idea of the article is to further enhance the logistics operations through digitalization in order to improve transit potential. Digitalization of the logistics industry is a matter of competitiveness of Kazakhstani global service. Therefore, the SWOT analysis is used in this section to discuss the holistic effect of logistics operations digitalization introduction (Table 4).

5 Conclusion

Digitalization is already transforming all the segments of transport and logistics, and according to forecasts, this will be the strongest trend in the coming years, which will radically change all the logistics activities. As technologies are developing dynamically, all economic and production processes are being digitalized. The Industry 4.0 is the major driver of majority digitalization operations, which include Logistics 4.0, as well. The main purpose of logistics 4.0 is digitalization of related logistics operations to increase effectiveness, profitability, productivity and optimization of costs and time. Such modern technologies have positive impact on transit potential of Kazakhstan since they directly influence the transportation activities.

The article considered relationship between digitalization of logistics operations and economic growth through use of the multiple regression analysis. The strong connection is identified during the calculation and analysis of existing strengths, weaknesses and possible opportunities and threats are discussed. Following the above - mentioned information, the following conclusions were drawn:

First, based on the growth rate, the digitalization of logistics is very important for the economic growth of Kazakhstan, which is one of the main factors and driving forces of Kazakhstan's economic growth.

Second, Kazakhstan should continue to increase the introduction of investment and logistics supplies in order to protect national economic development.

Third, Kazakhstan should improve the quality of technologies and training of related specialists, promote optimization and modernization of the logistics structure and economic transition and promote economic development.

Fourth, Kazakhstan's Statistics Committee should make reviews and statistics about modern areas as digitalization, sustainable development, etc., since most of the statistics are not available to conduct an analysis.

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