

DEVELOPMENT OF NATIONAL TRANSPORT INFRASTRUCTURE ON THE BASIS OF DIGITAL TECHNOLOGIES

XASHIMOVA NAIMA ABITOVNA

Doctor of economic sciences, Professor, Tashkent State Transport University.

ERGASHEV SHOXRUX VOSILJON OGLI

Basic doctoral student of Tashkent State Transport University. Email:shoxruhergashev1993@gmail.com

Annotation:

The development of the world society requires the introduction of digital infrastructure, the application of science in the production process, the strengthening of economic cooperation between countries, and the development of globalization. Also, the development of business processes between countries and within the country, of course, is directly related to the infrastructure created in it. In particular, studying the role of digital technologies in ensuring the efficient operation of the railway infrastructure, which is an important part of the transport system, is one of the requirements today. The article is devoted to the improvement of the railway infrastructure based on digital technologies.

Keywords: Digital Economy, Digital Technologies, Transport, Railway Infrastructure, Logistics, Business Processes, Freight and Passenger Transportation, Digital Documentation, Cloud Technologies, Electronic Platform, Automation Of Management Processes, Traffic Intensity, Global Logistics Centers.

INTRODUCTION

Technological modernization taking place in the world deals with the renewal of transport services of the national enterprise. However, according to the Association of Railway Industries (RIA), a threefold extension of the existing railway network by 2030 and the maintenance and maintenance of a dense network of railways in all EU member states, and by 2050 a large increase in medium-haul passenger traffic. It was noted that the implementation of the project will become a leading factor in economic growth in the transport sector. The railway network is one of the most important sectors of the country's economic growth, closely linked with the national economy. It is known that the structural changes taking place in the world, the transfer of capital to the sectors in demand, new developments, and the rapid application of technology in the railway infrastructure serve the economic development of a number of countries. The application of new digital technologies in industry, such as artificial intelligence and the Internet, leads to increased efficiency of business processes and labor productivity, as well as the solution of socio-economic problems of countries. [2]

It is known that in accordance with the Decree of the President of the Republic of Uzbekistan No. PF-60 dated January 28, 2022 "On the Development Strategy of the New Uzbekistan for 2022-2026" in our country, The task is to accelerate the development of the road network, "green corridors" for foreign trade in the transport sector, as well as to expand transit capacity and increase the volume of transit cargo to 15 million tons [3]. These circumstances require the rapid digitization of railway infrastructure, which is an important part of the transport system.

Analysis of the relevant literature

The economic literature, which reflects the first approaches in the field of infrastructure, dates back to long historical periods. In particular, the role of infrastructure in creating favorable conditions for the creation of material wealth in production was put forward in the works of economists A. Smith and D. Ricardo in the late XVIII and early XIX centuries [4]. "Infrastructure" as an independent term was first used in military terminology in 1951 by the North Atlantic Treaty Organization to effectively support the military. The term "infrastructure" began to be widely used in the economic literature in the mid-1950s. In this regard, it is worth noting the research of the Austrian economist P. Rosenstein-Rodan. In it, the infrastructure is a set of general service structures that provide a favorable environment for the development of private entrepreneurship operating in sectors of the economy aimed at meeting the needs of the population [6]. The content, place and functions of the infrastructure in the process of reproduction in society have a special place in the research of foreign economists A. Hirschman, R. Nurkse, R. Ioximsen, J. Clark, E. Simonis, A. Yangson [7]. According to the main scientific results of the approaches of these economists to the content of infrastructure, the following can be distinguished:

Firstly, the total sum of all direct income-generating means, equipment and working capital that provide economic activity with energy, transport services and telecommunications, in the broadest sense, are the structures that support the operation of the transport system;

Secondly, infrastructure is an integrated structure that ensures the continuity of the process of organization and development of all types of products, ensuring the separation of production activities into separate types of labor;

Thirdly, the development of an integrated socio-economic system depends on the activities of the institutions formed in society and the mechanism of its functioning. Therefore, infrastructure networks perform the function of providing integrated connectivity in this process.

Other scientific studies on the problem of infrastructure have revealed the importance of infrastructure in the period of its existence in terms of economic activity. Researchers V.A. Jamin, A. Yu. Sharipov, V.P. Krasovsky, S.S. Nosov, V.G. Terentev and V.N. Stakhanov carried out scientific researches in this direction. Aspects of its sectoral approach are shown by linking it to the types of ancillary production activities in creating the favorable conditions necessary for its implementation [8]. M. Amonbaev, a local economist, acknowledged that the theoretical analysis of market infrastructure is in some ways different from other infrastructures of the economy, noting that "infrastructure is an integral part of any integrated economic system and structure" (I cannot change this). [6]. Economists Sh. Sh. Shodmonov, U. V. Gafurov emphasize that the effective functioning of the market largely depends on the level of development of its infrastructure, and conclude that the market infrastructure is a system of institutions that serve to establish market relations and their smooth functioning [7]. An analysis of the above literature shows that the research conducted by these researchers on the transport system and railway transport infrastructure is a general study.

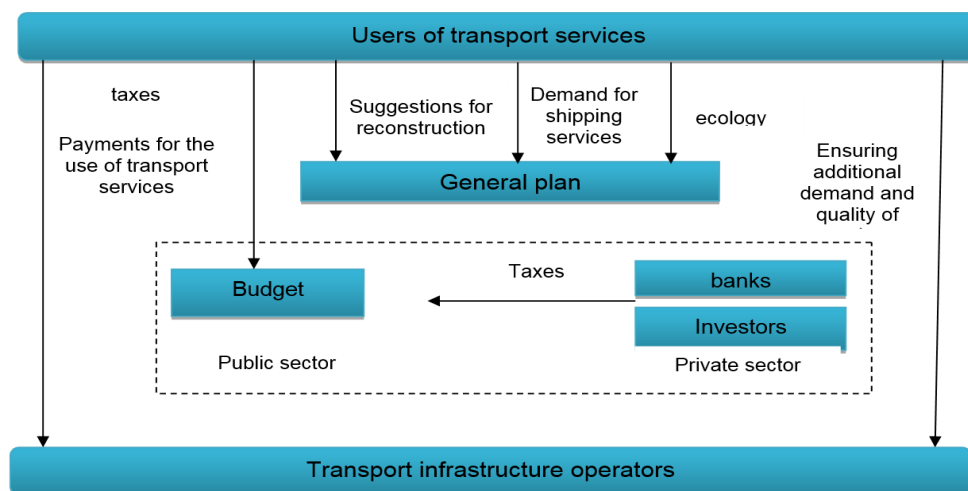
RESEARCH METHODOLOGY

This article analyzes the process of digitization of the transport system and the use of digital technologies in the railway infrastructure, the sources of formation of the digital economy of the country, as well as the transport system and its digitization of the world's leading organizations. Various reporting data on Methods of comparative analysis of the literature, logical and structural analysis, grouping and comparative comparison, economic-statistical analysis and substantiation of hypotheses were used as research methodology.

ANALYSIS AND RESULTS

Transport infrastructure is one of the largest sectors of the national economy, providing freight and passenger services between government and business entities, which contributes to the socio-economic development of the country. Manifests itself in elements based on an effective management model (Figure 1).

Figure 1: Concentrated model of national transport infrastructure



The economic importance of improving the national transport infrastructure is reflected in the processes of improving the efficiency of the transport system, the effective use of transport services in real time, as well as the effective organization and management of service quality. Therefore, in recent years, in order to ensure the compatibility of transport infrastructure in international, national and local markets in the world practice, priority is given to the organization of digital transport services, the formation of an electronic platform system.

At each stage of the digitization of the transport infrastructure, the supply chain is managed through a software system. As a result, it is possible to reduce costs in the management of the entire transport system in real time, reduce non-core costs, predict the development of the transport sector (Table 1).

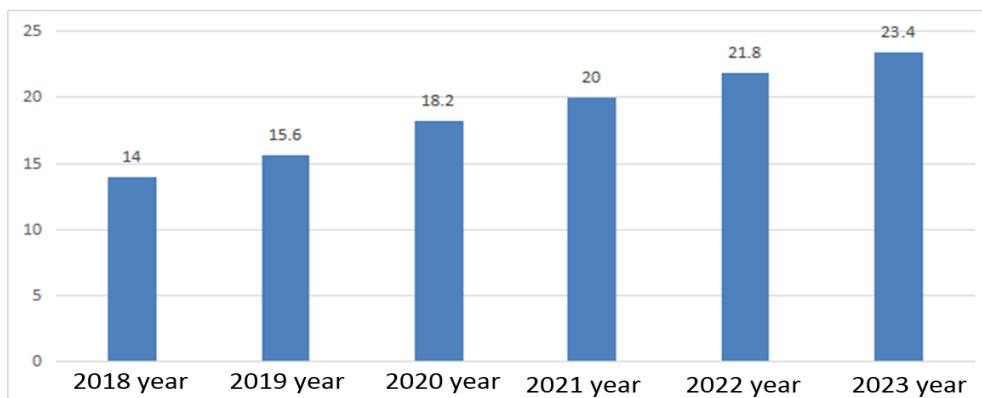
Table 1: Directions for the use of digital technologies in the transport industry

Direction of action	Scope of application of technologies
Electronic document management	Improving the quality of customer service through the introduction of e-tickets, remote processing of documents on routes, the creation of "virtual offices"
Remote communication	Using a digital technology system for live communication
Payment processing	Use of mobile payment and mobile applications to provide transportation services
Cloud technologies	Data processing at a qualitatively new level; Data analysis and collection using bigdata technology
Integrated transport management system	Automation of transport management system, involvement of the customer in the process of cargo management and control
Intelligent transport system	Forecasting of transport system development processes through automation of traffic management system, support of autopilot systems
Logistics services delivery platform	Creating a digital platform focused on the provision of logistics services, including booking tickets, searching for carriers for the delivery of goods, choosing the optimal route

The robotization system in the transport sector has already been put into practice and is developing at a very rapid pace. However, warehousing (packing and storage of goods) and maintenance of vehicles as the most labor-intensive component still require a wide range of manual labor. Automation of management processes in the transport system has been going on and developing for a long time. In fact, the transport sector is one of the first, and management processes are one of the areas where automation is automated. However, under the influence of the speed of modern traffic flows, an automated system cannot make competent and well-thought-out decisions without the human factor.

It should be noted that the process of using automated transport systems in the economy of each country is a topic of discussion and debate.

Figure 2: The share of new technologies in total global spending



Today, the share of spending on the creation of new digital technologies around the world is growing. The share of these indicators is projected to reach 23.4% by 2023. In 2020, the global pandemic has spurred further development of the industry. It should be noted that the share of funds spent on the creation of new technologies increased by 16% during the year. Traditional information and communication technologies (including software, equipment, information and telecommunications services) also decreased by 3%.

The following threats and dangers can be identified as direct consequences of transport system automation:

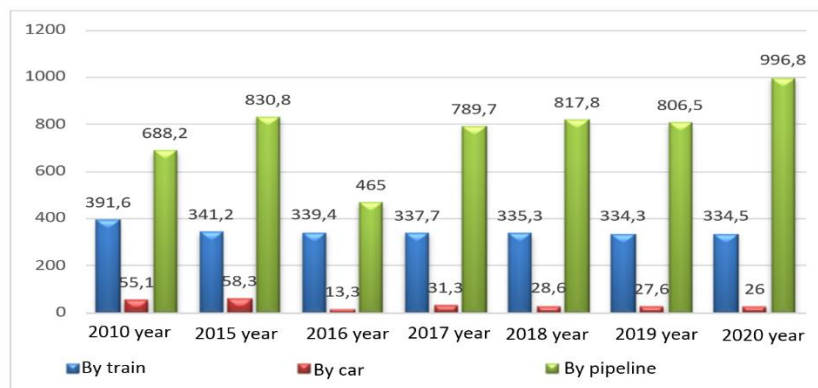
- Dismissal of specialists working in the field of transport, mainly those who can not find a job in their profession;
- Lar Difficulties in determining liability in the event of an insured event;
- Risk of software failure and loss of control over the vehicle being driven.

However, the advantages of introducing such technologies are as follows:

- Increasing the efficiency of the transport sector (reducing fuel costs, reducing accidents, reducing the number and proportion of victims of traffic accidents), -reducing the amount of cargo damaged during transportation;
- Reduction of wage costs at the expense of automated workplaces;
- Reduction of stopping time;
- Reducing the number of errors and omissions that can occur under the influence of the human factor.

The provision of freight and passenger transportation services is characterized by a wealth of unique features. Insufficient integration of production and distribution systems in the railway infrastructure leads to a decrease in the efficiency, quality and reliability of transport services. This is especially true in the timely delivery of goods, including the infrastructure that connects them. For example, in recent years there has been an increase in the volume of rail transport. However, there are also losses in the use of production assets (moving content, containers).

Figure 3 Dynamics of freight traffic in the Republic of Uzbekistan in 2012-2021 (million tons)



As can be seen from Figure 3, the volume of rail freight traffic in the Republic of Uzbekistan in 2010-2020 increased by 2.4% compared to 2010. It should be noted that in 2015-2016, a total of 2070.9 mln. Tons of cargo was transported. The share of railways in the total volume of freight traffic was 6.4%. The total volume of freight traffic in 2016-2017 amounted to 2203 mln. Tons and amounted to 134.8 mln. Tons, an additional 4.1% increase in the volume of

freight transported by rail in 2014-2015. In 2017-2018, the share of railways in the total volume of freight traffic was about 6 percent. This figure was 5.7% of total freight traffic in 2018-2019, 5.4% in 2019-2020, and 5.2% in 2020-2021.

In modern conditions, more attention is paid to the implementation of appropriate control technologies in solving the problem of untimely delivery of goods by rail. However, in practice, the violation of technological norms in the implementation of the delivery time may not give the expected result of these measures. In this case, it is advisable to identify the main causes of delays in the movement of goods, the timing and method of delivery of goods, the development of measures to eliminate them by improving the standards of transportation technology.

Table 2: Indicators of passenger traffic of JSC "Uzbekistan Railways" in 2017-2021

Years	The Volume Of Work Performed By Transport			Gdp Volume, Bln. U.S. Dollar.	Gdp Volume, Bln. U.S. Dollar		
	Passenger Turnover, Bln. Passenger-Km	Right Turnover, Bln.Tkm	Given Tkm, Billion		Passenger-Km / GDP	Tkm\ GDP	Given. Tkm / GDP
2000	30,9	54,6	85,5	13,8	3,96	2,24	6,2
2005	46,2	68,9	115,1	14,3	4,82	3,23	8,05
2010	83,8	60,4	144,2	46,7	1,29	1,79	3,08
2015	120,1	65,8	185,9	81,6	0,81	1,47	2,28
2016	126,0	65,3	191,3	81,8	0,8	1,54	2,34
2017	130,0	66,9	196,9	59,2	1,13	2,2	3,33
2018	135,3	71,3	206,6	50,5	1,41	2,68	4,09
2019	140,9	72,9	213,8	57,9	1,26	2,43	3,69
2020	117,4	69,4	186,8	58,8	1,18	1,99	3,17

The volume of freight and passenger traffic in Uzbekistan has been growing steadily in 2017-2019, while passenger turnover has sharply decreased in 2020. The main reason for this can be explained by the suspension of passenger trains as a result of quarantine restrictions during the COVID-19 coronavirus pandemic. Therefore, the expected passenger turnover by the end of 2020 will reach 1794.9 million. Pass.km. The expected performance in 2021 has allowed for full operation. The reason for the low result compared to 2019 was due to the fact that the movement of passenger trains on international routes is expected to resume in the 2nd quarter of 2021. The resumption of international passenger train traffic in the 1st quarter of 2021 is not expected due to the COVID-19 coronavirus pandemic.

Railways play a leading and important role in Uzbekistan. Another advantage of rail transport over other modes of transport is that it is less harmful to the environment. Its cargo and passenger carrying capacity is very high and moves regularly despite the adverse weather conditions.

Given the limited market for passenger transport on domestic routes, competition in road transport at the expense of intercity buses and private cars will be very high. Railway transport services will be improved due to the introduction of competitive tariffs and new routes. The end result is reflected in the transport intensity of GDP (Table 3).

Table 3: Transport intensity of the GDP of the Republic of Uzbekistan in 2000-2020

Years	The Volume Of Work Performed By Transport			Gdp Volume, Bln. U.S. Dollar.	Gdp Volume, Bln. U.S. Dollar		
	Passenger Turnover, Bln. Passenger-Km	Right Turnover, Bln.Tkm	Given Tkm, Billion		Passenger-Km / GDP	Tkm\ GDP	Given. Tkm / GDP
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According to the analysis of the transport intensity of the GDP of the Republic of Uzbekistan in 2000-2020, the regional characteristics associated with the development of railway transport in Uzbekistan had a direct impact on traffic intensity. At the same time, it is worth taking into account the fact that rail transport is cheaper than other modes of transport, can operate at any time of the year and has the ability to transport large volumes of cargo. In 2000, the volume of transport in GDP amounted to 13.8 billion. In 2005, this figure increased by 3.6% to 14.3 billion US dollars. U.S. dollars. In 2015-2016, this figure increased by almost 6 times. In 2017-2020, it decreased by almost 1.5 times compared to 2015-2016.

Chapter 2, paragraph 2.1 of the Decree of the President of the Republic of Uzbekistan "On approval of the Strategy" Digital Uzbekistan-2030 "and measures for its effective implementation" dated October 5, 2020 No PF-6079 , ensuring the coverage of tourist facilities with mobile networks ". In our country, comprehensive measures are being taken to actively develop the digital economy, the widespread introduction of modern information and communication technologies in all sectors and industries, especially in public administration, education, health and agriculture. In particular, more than 220 priority projects have been launched to improve the e-government system, further develop the local market of software products and information technologies, establish IT parks in all regions of the country, as well as provide the industry with qualified personnel.

The difference in the density of public railways in the regions of the country is explained not by the socio-economic development of these regions, but by natural factors. This is primarily explained by the fact that the area of some areas is extremely large, and vice versa, the area of some areas is small.

It is known that in the experience of leading countries in the world economy, achieving global competitiveness and access to world markets, first of all, consistent economic reform and structural changes are all related to the development of the transport logistics services market. The role of logistics services in the rapid development of every sector of the economy of Uzbekistan, including the transport system, is invaluable.

Therefore, the attention of influential international organizations to the development of our economy, as well as the attraction of foreign investors, the establishment of many joint ventures and their branches requires the development of new territories and access to international markets. To do this, first of all, it is necessary to have transport corridors and modern transport and logistics centers.

The growing demand for logistics services in the rapid growth of trade relations of the world has led to a special focus on global logistics centers, which are designed to implement the idea of integration of operations on an international scale [[https://7universum.com/pdf/tech/2\(95\) % 20 \[15.02.2022\] /Juraeva.pdf](https://7universum.com/pdf/tech/2(95)%20[15.02.2022]/Juraeva.pdf). Transport features of logistics. Universe sum: technical sciences: electron. nauchn. jurn. 2022. 2 (95).]. These logistics centers will lead to the modernization of the transport system in the country, the full financing and renewal of existing fleets. The main objectives of logistics centers are to provide public consumption and transport, loading and unloading, warehousing services, etc. by responding quickly to changes in consumer demand and the market situation. The results of the study show that transport companies affect the quality of transport services of shippers and consignees (adherence to shipping schedules, additional services, and delivery of goods anywhere in the world), improving the transport and logistics system of international freight and improving the efficiency of transport. Special attention should be paid to scientific and technical and social factors.

CONCLUSIONS AND SUGGESTIONS

In conclusion, in order to create a scientific, technical and technological base for information modeling in improving the national transport infrastructure on the basis of digital technologies, it is necessary to:

- Development of a methodology for the introduction of sensors for the continuous collection of primary data on the status of railway infrastructure and rolling stock;
- Development of digital models for all modules, structures and equipment, as well as the creation of a model of cross-sectoral integrated "digital relays" that coordinate high-precision business processes;
- Ensuring the training of qualified personnel to work in the information model and modernization of the design process;
- Development of data processing centers, communication networks that are resistant to failures and protected from cyber attacks.

Yaratish creation of intelligent systems for traffic management, freight and passenger flow management and automation of railway communication systems;

Thus, the improvement of railway transport is difficult to achieve without a comprehensive and systematic approach to the digitization of its components and without the analysis of technological processes. Digital modeling technologies or BIM technologies should be adopted as the basis, which are applied at each stage of the life cycle of the objects involved. In the near

future, digital models will be useful for creating components and aggregate data for railway infrastructure and rolling stock. Such a change would allow for greater efficiency in terms of quality through the use of additional technologies.

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