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**IMPROVING THE EFFICIENCY OF RAILWAY TRANSPORT SERVICES IN THE
CONTEXT OF UZBEKISTAN'S INNOVATIVE ECONOMIC DEVELOPMENT****Utepbergenov Allambergen**Teacher of the Department of "Economics and Tourism"
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Abstract. This article examines the theoretical, analytical, and organizational-economic aspects of enhancing the efficiency of services in Uzbekistan's railway transport sector within the framework of innovative economic development. The study identifies the socio-economic significance of transport services, the main factors influencing their performance, and the necessity of innovation-oriented management models. Using a systematic approach, the research analyzes the development trends of the national railway system, key performance indicators, and institutional reforms aimed at increasing competitiveness and service quality. Comparative analysis of international practices—particularly those of the EU, Japan, and South Korea—demonstrates that technological modernization, digitalization, and public-private partnership are crucial determinants of efficiency growth. The results highlight that improving the effectiveness of Uzbekistan's railway transport services requires an integrated mechanism that combines digital transformation, human capital development, and performance-based management. The paper concludes with practical recommendations for enhancing service quality, optimizing resource utilization, and strengthening the country's position as a strategic transport hub in Central Asia.

Keywords: Railway transport efficiency; service quality; innovative economy; digital transformation; Uzbekistan; organizational-economic mechanism; transport infrastructure; public-private partnership; logistics competitiveness; sustainable development

Introduction

In the era of rapid globalization and technological advancement, the transport sector plays a decisive role in ensuring sustainable economic development, national competitiveness, and social mobility. Among all modes of transport, railway services hold strategic importance for Uzbekistan due to the country's geographical position as a transit corridor between East and West. Efficient railway operations directly influence industrial output, regional integration, trade facilitation, and environmental sustainability.

The transformation of Uzbekistan's economy toward innovation and digitalization has created new requirements for the organization and management of railway services. Enhancing efficiency is no longer limited to reducing operational costs; it also implies improving service quality, ensuring punctuality, introducing digital solutions, and applying advanced management practices. "Uzbekistan Railways" JSC, as the core operator, is tasked with modernizing infrastructure, renewing rolling stock, and adopting international service standards.

This research aims to explore the theoretical and methodological foundations of transport efficiency, conduct an analytical evaluation of the railway sector in Uzbekistan, and

propose strategic recommendations for improving service performance in the context of innovative economic reforms.

Theoretical and Methodological Foundations

Transport service efficiency is a multifaceted concept encompassing technical, economic, and social dimensions. It reflects how effectively a transport enterprise converts its resources — infrastructure, rolling stock, labor, and technology — into high-quality services that meet customer needs at minimum cost. Efficiency can be expressed through indicators such as labor productivity, fuel consumption per ton-kilometer, turnaround time, cost per passenger-kilometer, and return on investment.

From a neoclassical economic perspective, efficiency is associated with resource optimization and cost minimization. Meanwhile, institutional economics emphasizes the importance of governance, regulatory stability, and market mechanisms in shaping transport performance. In the context of innovation-driven development, the focus shifts toward technological modernization, digital integration, and service diversification — all of which enhance systemic efficiency beyond mere financial indicators.

The efficiency of railway services is affected by a combination of internal and external factors:

- Technical and technological factors: quality of rolling stock, track infrastructure, automation, and use of intelligent transport systems.
- Organizational and managerial factors: staff qualifications, management structure, and level of coordination between departments and logistics partners.
- Economic factors: pricing policy, investment intensity, cost control, and government subsidies.
- Institutional and policy factors: state regulation, public-private partnerships, and international cooperation in transport corridors.

An integrated evaluation model should combine quantitative and qualitative methods — statistical analysis of key indicators, benchmarking with international standards, and expert assessment of managerial efficiency.

Modern economic thought recognizes that efficiency is not only a technical or financial indicator but also a systemic reflection of innovation capability, service quality, and customer satisfaction. Therefore, increasing transport service efficiency in an innovation-based economy requires a holistic system that integrates economic, organizational, and technological components.

Analytical Evaluation of Uzbekistan Railways JSC

Uzbekistan Railways JSC is the leading operator of freight and passenger rail transport. Between 2017 and 2024, substantial progress was made in infrastructure modernization and digital transformation. Key indicators of performance are shown in Table 1.

Year	Freight Turnover (mln ton·km)	Passenger. Turnover (mln pass·km)	Operating Cost Efficiency (%)
2017	21,300	12,500	72.5%
2019	22,800	13,400	74.2%
2021	24,100	14,200	78.0%
2023	25,900	15,300	81.4%
2024	26,700	16,000	83.0%

Table 1 demonstrates consistent growth in both freight and passenger turnover.

“Uzbekistan Railways” JSC (O‘zbekiston Temir Yo‘llari) remains one of the most significant enterprises in the country’s infrastructure system. As of 2024, the company operates over 7,000 kilometers of railways, with approximately 2,000 kilometers electrified. In recent years, substantial investments have been directed toward the modernization of locomotives, electrification of regional lines, and the introduction of automated ticketing systems.

The company’s development strategy aligns with the “New Uzbekistan 2022–2026 Development Strategy” and the Transport Sector Reform Program, emphasizing digital transformation, improved logistics connectivity, and energy efficiency. However, challenges persist in terms of aging infrastructure, limited innovation capacity, and a need for greater private-sector participation.

Furthermore, forecast values of passenger turnover of railway transport were developed, with the following model being utilised for this purpose. The data is stationary in its current state, and its analysis shows the following.

Prospective Directions for Improving Service Efficiency

The effectiveness of transport services depends on a complex set of factors that can be grouped into economic, organizational, technological, and institutional categories.

Economic factors include pricing policy, cost management, and investment efficiency. The availability of stable financial resources determines the potential for infrastructure renewal and technological upgrades.

Organizational factors involve management structure, workforce competence, and the degree of coordination among transport enterprises, logistics centers, and regulatory institutions.

Technological factors encompass innovation adoption, automation, and digitalization—particularly the use of intelligent transport systems, online booking platforms, and data-driven decision-making tools.

Institutional factors are shaped by government policy, regulatory stability, and international cooperation. In Uzbekistan, state programs aimed at transport sector modernization—such as the introduction of digital corridors, e-freight platforms, and transit simplification measures—are becoming key preconditions for enhancing efficiency.

In addition, the interaction between transport companies and consumers, as well as the introduction of performance-based management systems, plays an increasingly important role in ensuring both service quality and economic sustainability. Following the implementation of the Unit Root test for stationarity verification and the correlogram, the most optimal and reliable model for developing forecast values of the volume of cargo dispatched by rail transport of the Republic of Uzbekistan was selected. The following form was observed.

The following equation is to be solved:

$$(1-L)YH_t = 0,72 * (1-L)YH_{t-1} - 0,99 * (1-L)\varepsilon_{t-1} + 1,38 * t$$

YH - represents the volume of cargo dispatched by rail transport in the Republic of Uzbekistan, measured in million tons; t - denotes the trend, with data commencing from the year 2000.

The results of the criteria necessary to justify the adequacy and reliability of the proposed model are presented in Table 2.

The following table presents the results of the developed model for calculating the forecast values of the volume of goods shipped by rail in Uzbekistan.

Model 2: ARMAX, using observations 2001-2024 (T = 24)

Dependent variable: (1-L) YH

Standard errors based on Hessian

	Coefficient	Std. Error	z	p-value	
phi_1	0.722888	0.163933	4.410	<0.0001	***
theta_1	-0.999998	0.118146	-8.464	<0.0001	***
Time	1.37653	0.195084	7.056	<0.0001	***
Mean dependent var	1.316667		S.D. dependent var	2.832830	
Mean of innovations	0.165113		S.D. of innovations	2.559275	
R-squared	0.941303		Adjusted R-squared	0.935713	
Log-likelihood	-57.39842		Akaike criterion	122.7968	
Schwarz criterion	127.5091		Hannan-Quinn	124.0470	
	Real	Imaginary	Modulus	Frequency	
AR					
	Root 1	1.3833	0.0000	1.3833	0.0000
MA					
	Root 1	1.0000	0.0000	1.0000	0.0000

The high reliability of the results of z-statistics of each coefficient of the model, i.e. the fact that the probability indicators are practically zero, serves to justify the correct choice of form and type of model. The findings of this study corroborate the notion that a substantial proportion of the observed variations in the resulting factor are contingent on the factors incorporated within the model. Concurrently, the coefficient of determination is determined to be equal to 0.94. Concurrently, the MAPE indicator is minimal, with a value of 2.96. These results indicate a high level of reliability of the proposed model and the possibility of forming scientifically substantiated forecast values with its help.

These objectives are supported by Presidential decrees -4896 (2021) and Presidential decrees -295 (2022), which define measures for service quality and ecological safety.

Based on available statistical reports and sectoral analysis, the following trends are observed:

- Freight turnover increased by approximately 5–6% annually between 2020–2024, supported by industrial exports and regional transit.
- Passenger traffic has shown moderate growth due to improved service quality and the expansion of high-speed routes (e.g., Afrosiyob trains).
- Operational efficiency (measured as ton-kilometers per employee) has improved by around 12% since 2020, reflecting productivity gains from automation and digitalization.
- Energy consumption per ton-kilometer has decreased by roughly 8%, indicating gradual improvement in eco-efficiency.
- Despite these gains, logistics cost per ton remains higher than the regional average due to infrastructure bottlenecks and limited competition.

Discussion

The government of Uzbekistan has initiated a set of structural reforms, including the corporatization of “Uzbekistan Railways”, the creation of specialized subsidiaries (freight, passenger, infrastructure management), and the attraction of private investments through public-private partnerships (PPPs). The introduction of digital freight monitoring systems, electronic document circulation, and blockchain-based logistics platforms has significantly improved transparency and service tracking.

Furthermore, Uzbekistan’s participation in international transport corridors such as TRACECA, China–Central Asia–Europe, and North–South routes enhances its strategic

potential as a regional logistics hub. Nevertheless, sustained improvement requires institutional stability, long-term investment policies, and alignment with international railway operation standards (UIC, UNECE).

The comparative analysis reveals that Uzbekistan's transport sector is aligning with global efficiency trends. The share of digitalized logistics processes increased by 35% between 2020 and 2024. However, challenges remain in workforce training, capital financing, and cross-sector coordination. To address these issues, lessons from European and East Asian countries emphasize innovation-driven management and stable institutional support.

The forecast indicators developed using the model until 2030 have the following form (see Table 3).

The following table presents the projected values of the volume of freight dispatched by rail in Uzbekistan.

For 95% confidence intervals, $z(0.025) = 1.96$

Yillar	Prognoz qiymatlari	O'sish sur'ati	Standart xatolik	95 foizlik interva
2025	76,1	102,9	2,6	(71,1114, 81,1436)
2026	78,0	102,5	3,2	(71,8575, 84,2364)
2027	79,8	102,3	3,4	(73,0943, 86,5376)
2028	81,5	102,1	3,6	(74,4925, 88,4598)
2029	83,1	101,9	3,6	(75,9411, 90,1745)
2030	84,6	101,8	3,7	(77,3973, 91,7678)

In Uzbekistan, in subsequent years, a positive change in the volume of shipped goods by rail will be observed, however, the growth rate will have a downward trend in accordance with the increase in the forecast period. Specifically, the growth rate compared to the previous year was 2.9% at the beginning of the forecast period and is expected to reach 1.8% by 2030. This, naturally, justifies the need to develop additional measures to ensure the development of the industry. Because the demand for railway services is high, and at the same time, it is the transportation of goods by rail that is cheaper and more efficient than other types of transport.

According to the results of the developed forecast, the volume of freight dispatched by rail transport in Uzbekistan is expected to reach 84.6 million by 2030. This is 1.14 times more than the current situation, which means that the average growth rate during the forecast period will be 2.2 percent. Considering that the growth rate was 2.5% in the period taken as the basis for the forecast, the presented forecasts correspond to the existing trend. Because an increase in volume causes a certain decrease in the growth rate of the scale effect.

In recent years, the increasing mobility of the population has led to a sharp increase in demand for transport services. In particular, the demand for rail transport in interregional traffic is quite high. For this reason, an appropriate model was selected for calculating the forecast values of the number of passengers dispatched by rail, which has the following form.

Conclusion and Recommendations

The analysis demonstrates that the efficiency of railway transport services in Uzbekistan is steadily improving, yet remains constrained by infrastructural, organizational, and technological limitations. To fully realize the potential of "Uzbekistan Railways" JSC in the innovative economy, a set of strategic measures is required:

1. **Comprehensive Digital Transformation:**
Implement integrated digital platforms for ticketing, freight tracking, and financial management to reduce transaction costs and increase transparency.
 2. **Infrastructure Modernization and Electrification:**
Continue the electrification of key routes and renewal of rolling stock, prioritizing energy-efficient and environmentally friendly locomotives.
 3. **Performance-Based Management System:**
Introduce KPI-based evaluation for departments and employees to link operational results with incentives and accountability.
 4. **Human Capital Development:**
Expand specialized training programs in logistics, engineering, and transport economics to enhance professional competence.
 5. **Public-Private Partnership and Investment Attraction:**
Encourage private participation in cargo handling, station services, and rolling-stock leasing through fiscal incentives and transparent regulation.
 6. **Regional Integration and International Cooperation:**
Strengthen ties with neighboring railway systems, harmonize tariffs, and adopt international standards for interoperability and safety.
- By implementing these recommendations, Uzbekistan can achieve a modern, efficient, and innovation-driven railway system that supports sustainable growth and strengthens its position as a key transport hub in Central Asia.

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