DEVELOPING THE ECONOMIC EFFICIENCY OF IMPROVING THE DIGITAL SERVICES OF THE TASHKENT METRO.

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Annotation: This article describes the level of use of international Metropolitan digital technologies and the application of these factors in our country, as well as international translators.
Key words: metro, station, transportation.

In recent years, in order to develop the infrastructure of the Tashkent metro, additional underground and aboveground metro lines, as well as metro stations, have been built[1].

Tashkent metro station is the first in Central Asia in terms of the number of passengers transported, since 2021 it is under the control of the Ministry of Transport of the Republic of Uzbekistan. Tashkent metro was built in 1968-1970. The first route "Chilonzor" was commissioned in 1977. There are 17 stops in the "Chilonzor" direction, 11 in the "Uzbekistan" direction, 8 in the "Yunusabad" direction, and 7 in the "Halka" direction[1].

The Tashkent metro station was built seventh among the metro stations of the Commonwealth of Independent States. "Alisher Navoi" station was awarded the name of the most beautiful station among 17 countries of the world according to the results of the competition for architecture-construction and visual decoration of metropolitan stations [2].

The world experience of metropolitan construction shows that every new city, every new direction in the existing subway, a new page of project and construction, together with a complex of scientific research, is indispensable scientific research.

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[1] https://lex.uz/docs/5680287

Indicators	2016	2017	2018	2019	2020	2021
Passengers transported, mln. persons	**5560,4**	**5 679,0**	**5 951,5**	**6025,1**	**5295,9**	**6029,7**
railroad	20,5	21,1	22,1	22,9	6,2	7,9
automobile	5 480,8	5 591,3	5 852,8	5915,2	5248,5	5914,2
trolleybus	0,8	0,5	0,5	0,7	0,3	0,5
tram	2,7	2,3	4,4	3,8	1,2	2,3
metro (subway)	53,5	61,6	69,1	79,2	38,8	101,8
Passenger turnover, bln. pass-km	**126,0**	**130,0**	**135,3**	**140,1**	**118,3**	**137,0**
railroad	4,0	4,3	4,3	4,4	1,8	3,1
automobile	114,9	117,7	121,6	124,1	113,2	127,9
trolleybus	0,02	0,01	0,02	0,02	0,01	0,01
tram	0,01	0,01	0,03	0,02	0,004	0,01
metro (subway)	0,4	0,5	0,5	0,6	0,3	0,7

1-table

Looking to the statistics of stat.uz, it can be concluded that, the second most used means of transport appears to be metro, indicating 101.8 mln passengers in 2021. Therefore, improving the level of presented service is important [3].

The importance of improving metropolitan systems is crucial now and the following should be defined as the main directions of increasing the efficiency of metropolitan activity:

1. introduction of modern management mechanisms based on advanced foreign experience;
2. modernization of the infrastructure and gradual renewal of the traffic structure;
3. introduction of a digital process management system using modern information technologies;

To deal with these issues, the government developed several activities:

1. To accomplish the task of modernization of infrastructure and renewal of the traffic structure, proposed the organization of transport connections at 7 metro stations of the Tashkent metro (Beruniy, Chorsu, Pakhtakor, Almazor, Turkestan, Koyliq market, Chilanzor). Moreover, the establishment of parking lots for passenger vehicles coming from Tashkent region around 6 metro stations (Turkistan, Yunusabad, Chilonzor and the 3rd, 4th and 5th stations of the underground ring metro line). Besides, the installation of additional 80 new turnstiles in order to create more convenience for passengers at metro stations. Launch of Wi-Fi system at 12 newly built ground stations. Organization of services of other mobile operators at underground stations.

2. To increase the level of passenger and traffic safety by improving the security system, there proposed equipping the underpasses and stations of the underground ring metro line with video surveillance cameras. Furthermore, Transfer of optical fiber connection from the newly built metro lines (overground ring line, Sergeli, Yunusabad road II stage) to the "Situation Center" which is being established to ensure security in the metro [4].

According to the president's order the following measures will be implemented to increase the level of digitization in the public transport system of Tashkent city:

Improving enterprise activity by introducing ERP (Enterprise Resource Planning — Enterprise resource planning) system to the financial and economic activities of state-funded enterprises engaged in passenger transportation activities and integrating it with automated dispatch management (ASDUM) system;

- Development and improvement of the mechanism of making payments through existing electronic payment systems, electronic wallets, virtual cards and systems of mobile operators in public transport [5].

Providing all proposals to improve the metropolitan systems, it would be wise to analyze foreign countries' experience. Automation used in foreign countries is showing its effectiveness over many years. On new metro lines in different countries of the world, they are mainly implementing train traffic control systems over the air (CBTC). In addition, a number of major metros are moving to CBTC as part of the upgrade to ensure capacity growth and improve the level of automation and reliability of metro lines. The world's most widely used CBTC systems include the CITYFLO family of systems developed by Bombardier and used in subways and light rail vehicles with varying levels of automation, up to fully automated lines. An important advantage of CBTC is the ability to use this system as a base platform for the expanded use of digital technologies on the subway, since the train traffic control technology via a radio channel allows collecting and transmitting large amounts of data on the actual state of running and braking characteristics in real time to the diagnostic and maintenance center rolling stock, as well as the operation of its other components. This allows to optimize the maintenance of trains and respond in a timely manner to the deterioration of their operating parameters, avoiding failures in the transportation process [6].

In Russia, On September 4, 2019, VTB - Vneshtorgbank reported that more than 60,000 people a day pay for travel in the Moscow Metro using contactless payment turnstiles. In May 2019, VTB completed a project to modernize the turnstiles of the Moscow Metro, providing them with equipment for accepting bank cards. At all stations, at least two turnstiles in each lobby are equipped with readers for paying fares with bank cards and other devices with contactless technology [7].

However, in the U.S.A., to collect and analyze data on the state of the infrastructure, 4AI Systems proposes to mount video cameras on the head car of the train that form infrared images of track facilities, obstacles on the way and objects in the right of way at a shooting rate of 60 frames per second. The cameras

work in conjunction with on-board analytical tools based on artificial intelligence. Second company named Alstom proposed own solutions. Alstom's solution is based on the Urbalis 400 system, which implements CBTC functions. It is expected that due to the elimination of floor passing signals, the reduction of inter-train intervals and the increase in the speed of trains, the system will improve the safety of passenger transportation and line capacity, as well as reduce the life cycle cost. The MTA has been implementing CBTC on subway lines for several years using the systems of Siemens and Thales, and in early 2022, the first contract for the supply of CBTC was signed with the Japanese Mitsubishi Electric[8].

Economic efficiency of implementing digital technology in Tashkent metropolitan systems. Analyzing two well-developed countries' experience, it can be clear that developing digital data base is the right course of action. Another solution for improving digital stability of Tashkent metro is to initiate turnstiles, so that foreigners could understand and get tickets. In these turnstiles, the payments can be done through money and also with debit/credit cards. Costs approximately $1500 [9]

1-picture

	cashier	*Turnstile terminal*
Understands several languages	-	+
Uses paper	The same	The same
Energy/ power usage	Cashier's computer uses 400w	300w
Hours of work	8hrs	24hrs
Salary for 5 years	5 (years)*12 (months)*2 000 000 (average salary) = 120 000 000 sum	1500 ($ costs) *11320 (average rate of currency) =16 980 000 sum

2- table

According to the decision of the Cabinet of Ministers of the Republic of Uzbekistan on November 25, 2019 "On the introduction of an automated system for paying passengers on public transport[2]", an automated payment system was introduced on bus and metropolitan routes in Tashkent, and from January 3, 2020, single transport cards were put into circulation. There is an opportunity to replenish the account of single transport cards through metro cash desks, monthly Road ticket sales outlets, kiosks, all electronic payment systems, as well as through the ATTO – mobile application. Passengers make payments through single transport cards. All stations of the Tashkent Metro were fully provided with mobile and stationary validators for electronic payment [10-11].

Currently, the following payment methods are available in the Tashkent Metro:
- Single transport card (ATTO);
- One-time QR-ticket. It is valid for 30 minutes from the moment of purchase and is valid only at the station where it was purchased;
- NFC chip bank cards (Humo, Visa, MasterCard);
- With a QR code created in the mobile applications ATTO and Click.

By 2025, The Tashkent metropolitan area will increase by another 4 times, and the total length of the capital's underground railways will be 157 kilometers [12].

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