Innovative development of the automobile and road complex

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Abstract. The issues of the system approach to the automobile and road complex strategic development in accordance with the departmental project of the Ministry of Transport of the Russian Federation "The Digital Transport and Logistics" have been considered. They are a part of the national program "The Digital Economy of the Russian Federation" in connection with the Strategy of the Spatial Development of Russia for the period up to 2024. The national program is based on the transport modes infrastructure ensuring the areas interconnection and requiring the gradual modernization, digitalization and integration into one digital services ecosystem both for the transport individual modes and in the aggregate. The subjects of the study have become the automobile and road infrastructure objects that are the material and technical resources of transport services for the cargo, passengers and luggage transportation. However, the highway transportation in Russia holds the leading position in the cargo and passengers transportation total volume, where a significant proportion corresponds to the cities and agglomerations transport system with the deployment of cargo and passenger terminals, fuel stations, carriers and consumers of transportation services. The relevant national projects Passports being the background of the research and approved by the Presidium of the Presidential Council for the strategic development and the national projects contain the achievement of goals, targets and tasks in the format of instructions from the President of the Russian Federation to the Government. The technique of every national project (program) implementation in the relevant field at the first stage requires the conceptual strategic development, the digital technologies and the platform solutions reflected in the work.

1. Introduction
The keynote in the context of the national transport policy is the Decree of the President of the Russian Federation of 07.05.2018, No. 204 "On the national goals and strategic objectives of the national development up to 2024". They include the digital economy, safe and high-quality roads, science and education, which together determine the scientific, educational, technical and technological breakthrough as well as the future development of the transport sector. This ensures the change in the motor vehicles production structure in all the segments in accordance with the "Strategy of the development of the automotive industry of the Russian Federation for the period up to 2025", approved by the Decree of the Russian Federation Government of 28.04.2018, No. 831-r. The unmanned motor vehicles manufacture of passenger cars, light commercial and goods-carrying vehicles, buses, and advanced types of innovative transport on the territory of the Russian Federation include electric vehicles and gas-powered vehicles running on compressed natural gas.

The manufacture of unmanned motor vehicles is the highest achievement of the automotive industry in the implementation of the intelligent transport systems. The world practice of the
unmanned motor vehicles production and traffic testing has identified five levels of vehicle traffic automatic performance (autonomy), the requirements for the innovative transport infrastructure modernization, ensuring the passage of the unmanned motor vehicles, and the need to develop a concept of road safety with the unmanned vehicles on public roads. At the same time, the digital transformation of the road infrastructure ensures the implementation of the departmental project of the Ministry of Transport of the Russian Federation "The Digital Transport and Logistics" as a part of the national program "The Digital Economy of the Russian Federation".

2. Features of the automobile and road complex digitalization
The national spatial development strategy proposed by the President of the Russian Federation in the Address-2018, the strict implementation of the national projects require the gradual modernization, digitalization and integration into one digital services ecosystem both for the individual transport modes and for all the participants in the transport process in the aggregate.

The development and implementation of the digital transport economy must comply with the national project "The Digital Economy of the Russian Federation" approved by the Decree of the Russian Federation Government of 28.07.2017, No. 1632-r. The program document is based on the idea that the digital economy is an economic activity where the digital data become the key production factor allowing to form the information space with the transport infrastructure characteristics, the transport services consumers demand and the carriers offers. The target result of the digital transport economy should be a balance between the supply and demand for the transport services, the goods logistics and the passengers delivery based on the space monitoring of transport with the services provision to transport consumers.

The current practice of the national transport complex operating shows that the automobile transport is the most popular and susceptible to the digital economy in commercial terms. Especially it concerns public transport, which mainly forms the convenience and accessibility of the urban environment, acting as a digitalization indicator of a harmonious spatial development, connecting cities and agglomerations in various types of the transport communication depending on the route schedules. At the same time, the automobile and road complex digitalization has its own distinctive features in the automotive and road sector.

The motor vehicle fleet digitalization provides for the availability of the motor vehicles electronic passports circulated since July 1, 2018, the insurance policies of motor vehicles owners in a digital form, the installation of the emergency response indicators for the accidents "ERA-GLONASS".

It should be noted that the space group as a part of JSC “GLONASS” provides monitoring of the motor vehicles registered by all the indicators, the vehicles contour digitization and the effectiveness of the interaction between the participants in the transportation process.

The public road transport digitalization is determined by the transportation specifics. The general-purpose transportation is carried out by public buses in various types of communication depending on the route schedules. The schedule is made for each stopping point of the regular transport route provided for a mandatory bus stop. At the same time, buses are equipped with the satellite navigation monitoring equipment that provides the transportation dispatching and regularity, as well as the interactivity of bus traffic on routes for mobile digital services (smartphones and tablets) of the passengers, which allows the passengers to plan the trips. Moreover, it is proposed to introduce the transport cards and their validation everywhere (the ability to use a single card during transfers) [1].

An alternative to public transport in the digital circuit is the individual order systems in the mobile digital applications “Yandex. Taxi” and car sharing as subcategories of public transport. Any type of car sharing in the strategic development is an alternative to the global motorization, the benefits of which are outweighed by the growing burden of responsibility and ownership costs, which foreshadows the stage of declining the global motorization and opening the unmanned transport era with a widespread introduction of the intelligent transport systems [2].

The digitalization of the urban public transport is of particular importance in the strategic development. It involves the use of the unmanned vehicles and the image recognition technologies
(identification) of the passengers getting on public transport with an automatic fare payment from electronic wallets.

The cargo transportation digitalization is based on the cargo registration in a digital circuit congestion and the road traffic of freight rolling stock carrying heavy, oversized and dangerous cargoes. It is also based on the traffic interactivity of the motor vehicles that carry out the cargo terminal transportation in the main domestic and international routes along the certified transport corridors. The small consignments logistics delivery by light commercial vehicles in cities and agglomerations is determined by the digital interactions between the consignors and consignees. In this case, the electronic document management is combined in a single cargo digital circuit.

In accordance with the national project for the safe and high-quality roads, it is planned to introduce new technical requirements and standards of the roads arrangement based on the digital technologies and aimed at eliminating the accidents concentration. The introduction of the automated and robotic technologies of the traffic management and monitoring the compliance of the traffic rules are envisaged as well as the use of the new mechanisms for developing and operating the road network, including the infrastructure mortgages use, the life cycle contracts, the best technologies and materials. It is proposed to equip the "smart system" of safe and high-quality roads with indicators built into the road infrastructure for the automatic registration of congestion and the road traffic of freight rolling stock carrying heavy cargo in the payment system "Plato", illegal carriers, illegal parking and other violations.

An example of the innovative technologies is the construction of the Crimea main road - the Federal highway "Tavrida" with 3D-model technology. It provides the unmanned automatic mode operation of graders using a special equipment with an electronic map of the road. The electronic sensors work in the satellite monitoring system of the graders operation program and on-board computers that ensures the ideal profiling of the roadway by leveled indicators (marks) of evenness, slopes, transverse and longitudinal slopes of the road surface, taking into account the terrain. The asphalt laying is carried out by loaders ensuring homogeneity of asphalt mixture. Many sensors are built into the asphalt rollers that monitor the temperature of the asphalt mix and its compaction value. The georadar and laser inspections are carried out during the road operation to assess the condition and thickness of the pavement layers. In case of the violations, the scan results are formatted as digital models with the possibility of integration into the environment of design, reconstruction or repair of road sections [3].

During the construction of the road "Bypass of Khabarovsk 13–42 km" the expert supervision is done by unmanned drones. The drones transmit the panoramic images of the construction to computer monitors that make it possible to identify the technological flaws in the blading operation and compaction of the roadbed.

The creation of a digital circuit on roads based on the use of the electronic platform of the Etalon system enables to provide the digital interaction of the Federal Road Agency Rosavtodor with the subordinate organizations and applicants in the format of digital workflow and the presentation of technical requirements and conditions for placing advertising structures in the roadside area and joining road service facilities.

The road transport is not only an independent type of the transport system of the Russian Federation, but also an integral part of the urban, industrial and interacting transport modes in the multimodal cargo and passengers' transportation. Therefore, the conceptual approaches to the strategic development of the transport sector, formed as a result of the discussion at the state, government and departmental levels, have been determined of some complex directions:

1) the digital optimization of the multimodal direct and mixed (combined) cargo transportation with several transport modes through the transport and logistics hubs and in cross-border traffic requires the unification and integration of a digital telemetry platform using on-board computers for compatibility, trust, interaction and coordination of transport modes in logistics business processes that will streamline the work and responsibility of the operators;
2) the creation of a single digital integrated platform for the multimodal passenger transportation will allow the passengers to choose the best route for the transportation by any means of transport and in any combination, to purchase a single ticket with a guaranteed level of comfort and safety, the passengers loyalty considered;

3) the Association of the Digital Transport and Logistics with the Federal Centre of Competence should become an integrating and coordinating center of the transport complex digital transformation for all the industry digitalization participants under the Ministry of Transport of the Russian Federation; the Ministry has announced a competition to develop the concept of creating a digital platform of a transport complex of the Russian Federation, the project, as we think, being the foundation in the field of artificial intelligence and big data for the implementation of digital logistics.

The implementation of the digital transport economy is possible with the consolidation of science, education, business and government, which requires the creative development of the existing pass-through digital platforms and technologies and the creation of new ones. The environment necessary for the platforms and technologies developing, the effective interaction of the road transport market subjects includes the regulatory framework, the information structure, personnel and education, the information security and interoperability, in accordance with the state policy in the field of various transport modes [4–15].

3. HR Training

1. The key to the implementation of the departmental project "The Digital Transport and Logistics" is training the relevant industry personnel. The commonality of the transport problems and the unity of the digital performance indicators make it possible to form the digital circuit and technologies for the cargo and passenger transportation of the individual transport modes followed by the integration of the digital services into a single digital platform both for the individual transport modes and in the aggregate. This circumstance makes it possible to train and retrain the personnel in the educational program specialization of "The Digital Transport and Logistics" with an industry component (specializing in transport modes and its infrastructure facilities, training directions and educational programs being considered, a list of professions, positions and qualification requirements for them).

2. The basis for the digital transport staffing is the national project "Education". The introduction of the pass-through training, starting from the early vocational guidance of the secondary school students, implemented in the open online lessons "Proektoriya" and to the subsequent training of the skilled workers, middle and senior managers in accordance with the selected professional competences implemented by the project "Ticket to the Future" will allow to prepare a highly-qualified industry personnel provided that the platform for "The Modern Digital Educational Environment" would be created. This platform will ensure the high quality and availability of education of all types and levels. At the same time, the educational programs for the transport infrastructure digital transformation should be coordinated with the Federal Centre of Competence under the Ministry of Transport of the Russian Federation and meet the requirements of the national projects [16].

4. Conclusion

The paper has investigated the features and capabilities of the strategic implementation for the digitalization of the automobile and road complex in accordance with the requirements of the national projects.

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