Retail payments on public transportation under conditions of COVID-19

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Abstract. The pandemic has been a catalyst for both negative and positive developments in public transport fares. In the field of public transport, total automation of all segments of passenger public transport is required. The purpose of the study is to substantiate the problems of innovating payment services in public transport as part of the overall ecosystem of the payment business and to find directions for the innovative development of payment services and train payment systems in the context of the COVID-19 pandemic. The study uses a systematic approach and theoretical methods for generalizing and comparing data, a structured description of the characteristics of the Russian payment services market. The proposed directions of innovative development of payment services and train payment systems in public transport are proposed to be implemented in the general system of digital innovation of the economy (integration of automated fare payment systems into a unified system of state and municipal services, inclusion of all intracity and intercity carriers of all types of transport into the automated payment system for passenger transport services, transport roaming / mutual integration of systems, introduction of differentiated fare payment by zones, expansion of the range of payment instruments, fiscalization of the services of transport companies, the transition to a fully automated system of payment for the train with a complete rejection of the physical presence of conductors).

1 Introduction

The Russian economy and the public transport sector are experiencing pandemic shocks and challenges. The crisis caused by a change in the usual behavior of consumers of transport services creates not only new threats, but also opens up new opportunities. In the context of the pandemic, new trends have emerged in the field of public transport. These are behavioral changes made possible by digitalization. With the widespread adoption of smartphones, the development of online payment services and robotic solutions in retail payments, the speed of transactions is increasing. In the field of public transport, there are trends in contactless online payments, the direction of cost optimization and the generation of new sources of income has intensified. Under the influence of applied scientific developments, the retail
payment market is digitalizing at a higher rate than other financial [1] and non-financial spheres [2, 3]. The digitalization of payments in public transport is an accelerator for the digitalization of technological processes. It can be argued that digital innovation in retail payments is driving digital transformation and digitalization in public transport.

In order to meet the expectations of consumers of public transport services amid the expansion of personal vehicles, the traditional public transport industry must implement new digital solutions. One of the key areas with great potential for the digitalization of operational and financial processes is the field of public transport.

Retail payments on public transport are one of the most reliable indicators that measure the dynamics of the daily life of service consumers. The demand for public transport services directly depends on the state of business and consumer activity and the introduction of lockdowns. According to the Russian payment system Zolotaya Korona (which is the founder of electronic payment systems for public transport and the largest issuer of transport cards in Russia), in 37 regions of Russia where the Electronic Pass system operates, since the start of the pandemic in April 2020 - there was a maximum drop in passenger traffic. The number of trips in April 2020 decreased by an average of 60% compared to April 2019. After the lifting of travel bans, the volume of transport services slightly recovered (in August 2020, the decline was 18%, and by the end of September 2020, generally recovered, but the “second wave” of the pandemic interrupted this positive trend).

Thus, the public transport sector is a sensitive indicator of consumer behavior in the context of COVID-19. Payments on public transport not only embody digital innovation, but also set digital trends for deepening digitalization in related areas that are traditionally non-digital. These circumstances determine the relevance of this article and the study of the features and prospects of retail payments on public transport in the context of uncertainty and risks posed by the impact of COVID-19.

2 Materials and methods

The study uses a systematic approach and theoretical methods for generalizing and comparing data, a structured description of the characteristics of the Russian payment services market.

Modern trends in the digital economy and digital innovations were considered in [4-7] and others. Innovations and innovative technologies were studied [8-11] and others. The works are devoted to the conceptual issues of retail consumer markets and the social significance of the sphere of retail services in Russia [12-15] and others. Sectoral aspects of innovation in retail payment markets have been developed [16-18] and others. Nevertheless, the issues of digital innovation in such an important socio-economic sphere as public transport remain insufficiently studied.

The novelty of the study lies in the fact that for the sustainable development of payment services on public transport in the context of the COVID-19 pandemic, a number of areas of innovative development of payment services and train payment systems are proposed.

The purpose of the study is to substantiate the problems of innovating payment services in public transport as part of the overall ecosystem of the payment business and to find directions for the innovative development of payment services and train payment systems in the context of the COVID-19 pandemic. Research objectives: 1) establishing the impact of the COVID-19 pandemic on the state of payment services on public transport; 2) substantiation of the directions of innovative development of payment services and train payment systems on public transport.

The theoretical significance of the study is to substantiate the provisions on the organization of retail payments on public transport in the context of pandemic restrictions and the use of digital innovations.
The practical usefulness of the study lies in expanding the tools and boundaries of payment for public transport services and minimizing the negative manifestations of pandemic risks through the use of digital innovations in public transport fares.

3 Results and discussion

In the pre-pandemic period, the public transport sector in Russia was digitized locally. Localization was expressed in the fact that local projects for automating fares were implemented, but the dynamics of overcoming localization was low.

The pandemic has been a catalyst for both negative and positive developments in public transport fares.

The negative phenomena include a general decrease in demand for passenger transportation in the most massive segments (with the exception of taxis), a decrease in payment turnover and a reduction in carriers' investment programs for digitalization. This is due to the isolation regime for consumers in large cities and the decline in business activity of businesses.

But there are also positive processes that indicate qualitative changes in the field of passenger transport:

— The popularity of non-cash (and primarily contactless) payments has grown significantly. Analytical data of the Electronic Pass system show an increase in the share of non-cash payments from 64% in 2019 to 71% in 2020. The given data correspond to the general dynamics of the retail payment market: according to the data of the Bank of Russia for the first half of 2020, the number of non-cash payments was about 69%. In public transport, the share of non-cash payments (especially mobile payments) has increased (see Error! Reference source not found.).

— The functions of the traditional payment instrument, the transport card, have been expanded. For example, during the first wave of pandemic restrictions in Moscow, personalized transport cards served as electronic passes. By blocking cards for retirees, the spread of the COVID-19 virus among the most vulnerable groups of the population was limited. The Troika city transport card turned out to be the most suitable tool for controlling the movements of the Moscow population. The use of bank cards for this purpose turned out to be impossible due to stringent international requirements for data exchange protocols. Transport cards have simplified data exchange protocols, so it was easier to configure them to solve operational problems. Experience has shown that transport cards have great potential for wider use.

![Table 1. Mobile payment services for public transport.](https://doi.org/10.1051/e3sconf/202338905050)

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Transport cards in Moscow and large Russian megalopolises fulfill their potential to a greater extent than in regional cities. In the regions, there are problems not only with the expansion of the functions of payment cards and the localization of payment services, but also with their practical implementation in all types of public transport. The current situation in the Russian regions is characterized by the following:
• a decrease in passenger traffic not only due to pandemic restrictions, but also due to the flow of labor resources from the regions;
• with the introduction of automated fare payment systems, the costs of carriers for organizing the acceptance of fares increase by the cost of providers' services (regardless of which ecosystem the provider belongs to);
• the revenue of carriers for the carriage of passengers and baggage on routes does not increase, since tariffs for transportation are regulated by the state (for intracity and suburban transportation, as well as part of intercity transportation for certain types of transport);
• providers of transport payment services cannot provide a number of technological aspects that critically affect the margins of a passenger transport business, namely: liquidity and operability of balances on payment cards, flexible zonal payment, compensation for reduced fares for all categories of passengers, non-personalized use of transport cards, and etc.;
• in fact, the introduction of automated fare payment systems does not affect the quality of service to the population and does not lead to an increase in the efficiency of passenger transportation, since the duplication of automated systems is forced by manual operations and their control at all stages of the provision of transport services.

Thus, it becomes obvious that it is necessary not only to overcome the localization of transport card systems within the territories, but also to overcome the functional limitations of the operation of transport cards. We believe that in the digital economy, local models do not have sufficient potential for the growth of public utility [16], yielding to open models of payment systems and services, which are more capable of accepting and accelerating the spread of digital innovations. Local payment services need openness and points of interaction with subjects of the payment market in the interests of end consumers [16]. We believe that the entry of existing automated transport systems into higher-order ecosystems is required.

In Russia, a legislative basis is being developed for the development of ecosystems [18]; in practice, open and closed ecosystems Yandex, SBER, MTS, VTB and others are actively developing. The overwhelming majority of them are supervised by the state, which a priori guarantees success in modern Russian conditions.

In the field of public transport, effective inclusion in ecosystems requires, first of all, total automation of all segments of passenger public transport. Statistics confirm the existence of such a possibility: if in 2016 automated systems were used in 50% of Russian regions, then in 2021 all Russian regions use cashless payment systems for transport. According to expert estimates, the capacity of the intracity passenger transportation market in Russia is about 400 billion rubles. Obviously, there is a competition between market participants, in which those participants who (among other things) offer the market innovative modern conditions for the provision of services, will win. Three large blocks of players participate in the competition.

1. Banks that issue bank cards or provide services for acquiring bank cards, which are used to pay for passenger transportation services. In recent years, the number of transactions using bank cards on public transport has increased several times, and the rate of their growth is outstripping the use of transport cards. As a rule, payment with a bank card is more convenient not only for passengers who do not have benefits. This form of payment is also convenient for carriers and operators of automated fare collection systems. Card issuers and card acquirers pursue different tariff policies, compete with each other for more attractive terms of servicing the payment turnover. By choosing the most favorable conditions, operators and carriers can regulate the profitability of their own business.

2. Federal transport card operators. In recent years, a new trend has emerged: federal operators are pursuing a policy of expansion into the regions (for example, the operator of the Moscow project Troika). It is obvious that in Russian conditions it is rather difficult to ensure equal competition between the largest federal operators and small regional operators. The position of regional operators will depend on the demand for such a service from
consumers and the choice of consumers. There may be risks of maintaining local business. Federal players will enter the region not only in order to ensure the acceptance of their cards here, but for a full-fledged presence with the absorption of regional operators.

3. Regional operators of transport cards. A regional operator can be municipal, state or commercial. Russian practice shows that regional operators go beyond their own region and start operating on the territory of another region. As a rule, this is not due to an aggressive policy to capture the market.

The presence of three blocks of players creates conditions for different promising scenarios: collaboration, displacement, takeover of transport companies and operators of automated systems. On the one hand, any business will be more successful if it is scaled up. Therefore, the presence of large federal operators is viewed positively from an economic point of view. On the other hand, in order to solve the urgent Russian problem of leveling the development of regions, the support of regional operators is required.

The considered market participants and the economic models they implement (regardless of their combination and dominance) should become one of the mechanisms for the sustainable development of finance in industries and regions. To do this, in our opinion, first of all, it is necessary to get rid of the local nature of payment services in the field of payment for public transport services and other similar areas, using the possibilities of digital innovation in the payment business.

The impact of the COVID-19 pandemic is creating new challenges and exacerbating old unresolved issues in all areas. There cannot be only a technological response to market challenges; a complex of business solutions is needed for successful development. The following directions of innovative development of payment services and train payment systems on public transport are proposed:

- the integration of automated fare collection systems into a unified system of state and municipal services, which will allow:
  - receive real-time information about the preferential categories of passengers and the differentiation of fare benefits by category of passengers;
  - promptly reimburse the costs of carriers for servicing privileged passengers;
- inclusion of all intracity and intercity carriers of all types of transport in the automated payment system for passenger transport services, which will allow:
  - to legalize the activities of all carriers;
  - use forms of state support for carriers of all types of transport;
  - transport roaming / mutual integration of systems, which will allow:
    - use a transport card to pay for travel not only in the region where it was issued, but also in others;
    - integration of existing systems will allow participants to obtain a synergistic effect, increase the attractiveness of transport cards and their competitiveness relative to other payment instruments;
    - jointly respond to new challenges and risks, including those caused by pandemic restrictions;
    - lobby for the interests of market participants;
  - the introduction of differentiated fares by zones, which will allow:
    - use flexible forms of payment for services;
    - reasonably adjust transport traffic;
    - justify the level of state support for carriers;
    - save consumer costs;
  - expanding the range of payment instruments, which will allow:
    - use universal and co-branded payment instruments (bank cards with consumer applications);
    - use bonus mechanisms;
fiscalization of services of transport companies, including fiscalization through cloud cash desks, fiscalization service for roll products, provision of an online fiscal receipt, which will allow:
— to ensure the transparency of the fiscal control of fare payments;
— reduce the time and costs of the carrier for processing fiscal information;
— to increase the speed of information transmission to the fiscal authorities;
• transition to a fully automated train payment system with a complete rejection of the physical presence of conductors, which will allow:
— improve the economic performance of carriers by saving on wages for conductors;
— to ensure a more complete collection of payments;
— use the system for vehicles of different capacities.

4 Conclusion

The pandemic has been a catalyst for both negative and positive developments in public transport fares. In the field of public transport, total automation of all segments of passenger public transport is required. There is a competition between market participants, in which those participants who (among other things) offer the market innovative modern conditions for the provision of services, will win. Three large blocks of players participate in the competition: issuing and acquiring banks, federal transport card operators, and regional transport card operators. The presence of three blocks of players creates conditions for different promising scenarios: collaboration, displacement, takeover of transport companies and operators of automated systems. The considered market participants and the economic models they implement should become one of the mechanisms for the sustainable development of finance in industries and regions.

The proposed directions of innovative development of payment services and train payment systems in public transport are proposed to be implemented in the general system of digital innovation of the economy. It is advisable to project the fundamental mechanism for the dissemination of digital innovations to other socio-economic spheres and thereby accelerate the creation of a single digital ecosystem in the economy and society.

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References