



The Impact of Digitalization and Infrastructure Development on Domestic Tourism in Russia

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Abstract. The tourism industry is a powerful tool for developing the country's economy, as it contributes to creating new jobs and capital inflow. Tourism development is closely linked to the development of infrastructure, as well as to the rapid introduction of information and communication technologies (ICT) and extensive digitalization. The authors assessed the impact of digitalization factors and infrastructure development on domestic tourism in Russia. Two final models were described as a result of the econometric analysis. The number of tourists in the region was chosen as a dependent variable, and the infrastructure development index (IDI) /transport development index (TDI), the costs of implementing and using digital technologies, and the number of hotels proved to be significant explanatory. Our analysis shows a 1% increase in the costs of introduction and use of digital technologies in the first model corresponds to the rise in the number of tourists in the region by 0.15%, and by 0.13% in the second model. The results indicate that 1 unit rise in the TDI leads to an increase in tourists by 20.2%, and the IDI growth by 1 unit implies to an expansion of tourist flow by 70.5%, which is due to a reasonably low spread of these indices. Thus, the development of domestic tourism is closely related to the spread of digital technologies in the regions and infrastructure development.

Keywords: Digitalization; Domestic tourism; ICT; Infrastructure; Transport

1. Introduction

Tourism is one of the fastest-growing areas in the economic sphere. Analysis of the dynamics of funds received from tourist product sales in Russia shows an upward trend with cyclicity. Thus, the growth phases fall on the 2011-2013 and 2016-2019 periods (see Figure 1). Due to the coronavirus pandemic, there was a sharp decrease in tourist flows in 2020 and a double decrease in the funds received compared to 2019 (Drianda et al., 2021).

This article examines the development of domestic tourism in Russia, as the pandemic and the political situation has led to a decrease in the international tourist flow. Figure 2 reflects the number of tourist trips in Russia from October 2020 to February 2022 and shows a slight increase in the domestic tourism flow compared to the same periods in the past, an average increase is 27%.

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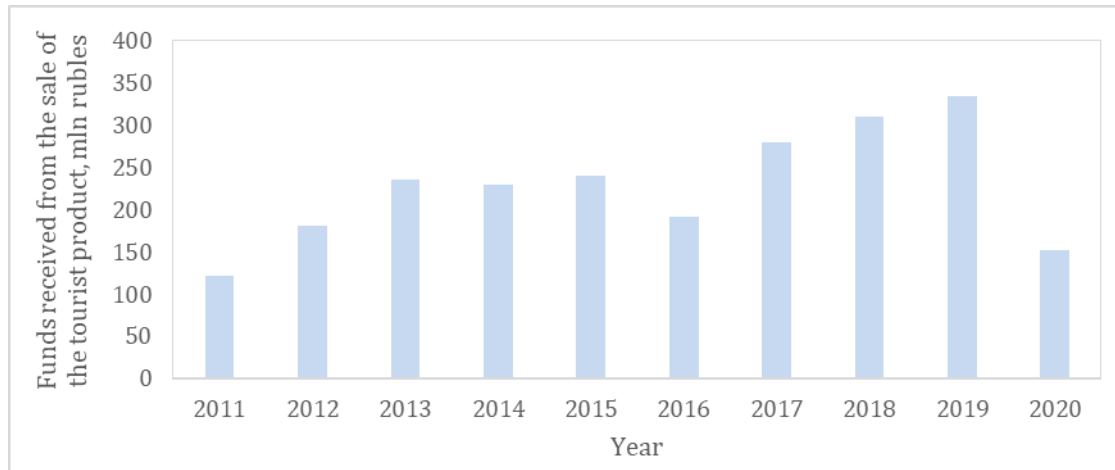


Figure 1 Dynamics of funds received from the tourist product sales in Russia, 2011-2020 (Data available: <https://opendata.tourism.gov.ru/7708550300-tourpackagescosts>)

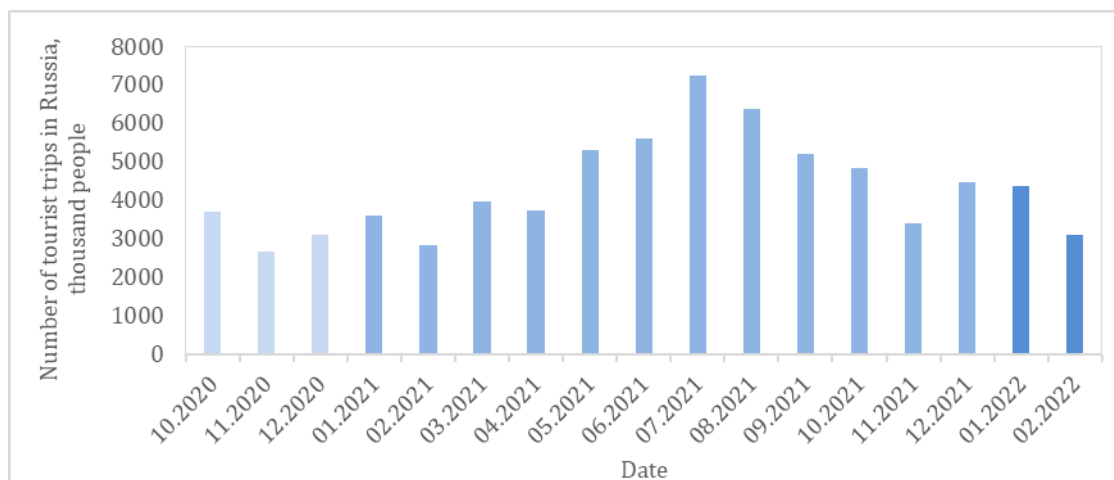


Figure 2 Number of tourist trips in Russia, 10.2020-02.2022 (Data available: <https://opendata.tourism.gov.ru/7708550300-ChisloTurpoezdok>)

Domestic tourism is a powerful tool for the growth of the national economy and regional development (Berawi et al., 2021), as it promotes new employment opportunities and capital inflows (Widaningrum et al., 2020). Its effect is closely related to the development of infrastructure (Khadra et al., 2019; Korchagina & Shignanovna, 2018), especially in the sphere of transport (Zhou, 2021), as well as the rapid introduction of information and communication technologies (ICT) (Milićević, et al., 2020; Aleksandrov & Fedorova, 2019) and extensive digitalization (Barykin et al., 2021; Sari et al., 2021). Thus, the 'Tourism and Hospitality Industry' National Project was approved in August 2021, one of the main goals is to stimulate the development of domestic tourism in Russia through the formation of tourism infrastructure and creation of high-quality tourism products, increasing the availability and awareness of tourism products.

Many studies have been devoted to assessing the relationship between tourism and economic, political, geographical and technological factors.

Thus, Kozlov (2015) reveals issues of the influence of various factors on the development of the domestic Russian tourism. Modern socio-political context leads to the fact that usual methods of competition for the Russian tourist cease to operate, which leads to the need and further implementation of non-market options for competitive actions. The author argues that household incomes increased in nominal terms in 2015, but real

revenues decreased due to a significant increase in inflation (inflation was 25% for that period, according to the available data). This has led to a steady increase in the average cost of tourist services in the country. Even those tourist destinations regarded as inexpensive and quite affordable by the citizens of the Russian Federation, showed a sharp rise in prices. The cost of domestic transport services also went up. Subsidized flights ended fairly quickly, and bankruptcies and closures of significant airlines tended to reduce competition in the market and increase fares as a result. Thus, the variables listed above cannot lead to the desired growth in tourist demand for domestic tourism in the Russian Federation. Based on the result, the government decided to take an unfavorable pathway, with the increase of the domestic tourism flow driven by the last two variables in 2015, namely the rise in the cost of outbound tourism and random events that instantly turn into national disasters. The author considered terrorism as a DUM-factor. Tourism markets in some Middle Eastern countries, such as Syria and Egypt, found themselves in a difficult situation in 2015. Turkey, popular with Russian tourists, was no exception, as air communications with Russia were temporarily suspended due to state conflicts. Unfortunately, tourism has become a victim of all types of terrorism, from religious to social. Oddly enough, this played a bright side for Russian domestic tourism, since most tourists rejected vacation in the above well-known places, European resorts have risen sharply in price, so the tourist demand, especially among the CIS population, has spread to something 'closer', namely to domestic vacation sites. Based on the model, the author concluded that the cost of the outbound tourism and random variable of one-time events had a tangible impact on the domestic tourism growth.

In contrast to the results of the previous paper, [Gladilin and Gladilin \(2016\)](#) analyzes the number of arrivals or expenses incurred in the host country. The authors use the regression analysis to forecast tourism demand based on the previous period's data. The following variables were taken as independent, they are income per capita in the country of origin (personal income is usually used for private tourist trips or trips to visit relatives and friends, while other general measures of income, such as national income, are used for business trips); costs that include costs of transportation to the destination, expressed in the currency of the country of origin (the cost of transport is determined using airfare, or the cost of fuel if using ground transportation), and expenses incurred at the destination (cost of accommodation, etc.); exchange rate, although to some extent, it is connected to other price indicators; costs of substitute products. Potential tourists usually compare the costs of their future vacation with the costs at home and during previous holidays spent elsewhere. Such benchmarking can be an important determinant of demand for international tourist trips to a given destination. Consequently, comparable fees can be included in the above model as weighted averages (travel and accommodation costs); the event variable can be included in the international tourism demand model to assert the impact of one of the historical events; the indicator of the activity of promoting a tourist product reflects the costs of its promotion abroad. These costs are taken into account by the management of the tourist center and can play a significant role in determining the demand for international tourism. They are calculated in the currency of the country of incurring, i.e., the country of origin; variables that confirm attachment to a particular area (if tourists spend a vacation and later have pleasant memories of the resort, they will undoubtedly return).

[Frolova \(2015\)](#) presents other quantitative research methods for assessing the economic efficiency of the resort type of activity, differing from the above works, such as methods for constructing coherent information structures, a wide range of econometric modeling methods, methods of cartographic taxonomy, and others. A graph model has been

developed to determine the key factors that affect the tourism development activities and recreation in general. The author in her work uses such indicators as the number of tourists and indicators related to the seasonality of the recreation industry to build a model describing the influence of factors on the development of tourism and recreation in the region. The number of people arriving at health resorts is most often used for research. The main factors that have the most significant impact on the tourist and recreational activities of the region were identified: the number of municipalities, namely culture; emissions of pollutants from stationary sources; fixed assets in the economy; the population of the area; information coverage; turnover of organizations, i.e., hotels and restaurants; a number of health resorts and recreational organizations.

The level of tourism infrastructure development largely determines the demand for inbound tourism in a particular region. The current state of the tourism business in most Russian regions has poor development, which does not correspond to the country's significant potential with unique natural attractions and monuments of history and culture of world significance. The econometric model based on the Archer and Owen model for the analysis of profitability from tourism activities is proposed by [Lapinova & Lipatov \(2017\)](#). The assessment of the economic impact of tourism is based on the tourists' expenditures, which take into account their expenditures in various types of business, i.e., transport, accommodation, meals, excursions, souvenirs, etc. The authors used the volume of paid services hotels and other specialized accommodation facilities provided to tourists as a dependent variable. The number of hotels and other special accommodation facilities, amount of paid services provided to tourists by hotels and other specialized accommodation facilities, average per capita income by regions of Russia, the number of overnight stays registered in hotels, size of room capacity, paid tourist services rendered to the population, access to the sea, number of attractions, number of people accommodated in hotels and other accommodation facilities, and overall population of the region were used as independent variables. The dependent variable is the volume of services purchased within the region under consideration; the purchaser can be both a resident and a visiting tourist. It is assumed that the number of travel agencies and hotels demonstrates the level of the region's material and technical development of tourism. While the number of employees help determine the travel agency's average size and find out what companies people mostly trust. The number of tourists staying in hotels should directly impact the amounts of paid hotel services and hence on the amounts of paid tourist services as a whole. There is also an assumption that the population of the region may be significant in the model, however, the inclusion of this variable in the regression equation of the model can lead to a solid multicollinearity.

[Lapinova & Lipatov \(2017\)](#) concluded that in the Russian Federation a greater volume of tourist services is acquired in landlocked regions. The development of the tourism industry in the region inspires a more significant consumer's confidence in tourism services and positively affects their sales figures. People prefer to stay in small cheaper hotels instead of large and expensive ones. The results of the analysis also showed that income plays a significant role in the purchase of tourism services by the population. It is difficult for small tourism enterprises to maintain their position in the market due to consumer preferences for tourism products. The unstable political situation also leaves its mark on the attractiveness of domestic tourism.

[Zhang & Ju \(2021\)](#) analyzed the spatial structures of tourist resources on Hainan Island in terms of spatial variability and association. An analysis was made of the spatial and temporal structure of the number of tourists and tourism income during 2010-2019. Based on the geographical detector, the factors affecting the development of tourism were

investigated. The authors also conducted a factor analysis, which showed that six factors had a significant impact on the number of tourists: density of the road network, number of hotels, gross domestic product per capita and share of tertiary industry in GDP were substantial at 0.05, while population and tourist resources were substantial at 0.1. It is noteworthy that the explanatory power of the number of hotels reached 0.97, mainly in view of the fact that hotel business development was closely related to the tourists' choice. In addition, as described above, the density of the road network has a significant impact, as a higher density of the road network can significantly increase the availability of tourism resources. The tertiary industry share in GDP has also had a significant impact, as an increase in the percentage of the tertiary industry leads to a more remarkable development of the local service industry and better service facilities.

Vorobey (2021) presented that the dynamics of the tourist flow in Russian regions depends on many factors, which include the income of the Russian population, which determines the material opportunities for visiting the country's tourist regions, the tourism infrastructure development degree, current exchange rates, costs of recreational and tourism services, costs transport links in the region, as well as governmental support for the recreation and tourism sector through various benefits, direct and indirect subsidies, information assistance, investments in tourism infrastructure and infrastructure of related industries (transport, communications, trade, energy, etc.).

Some authors assessed the impact of digitalization on tourist flows and the number of tourist services. Thus, Gholipour et al. (2021) revealed a strong positive relationship between the number of foreign tourists and capital investments in telecommunication technologies, as well as with GDP per capita, exchange rate, and tourist arrivals in the previous year. An increase in investment in telecommunications by 1% leads to a rise in the number of foreign tourists by 0.33%. Thus, ICT development is an essential factor in determining the effectiveness of tourism development. Al-Mulali et al. (2021) assessed the impact of digital technologies on the number of tourists and income from tourism activities. The digital adoption index, real GDP, and consumer price index were used as independent variables. The results proved that introduction of digital technologies has a positive and significant relationship with the number of tourists and tourism income at the 1% significance level. Thus, 1% rise of the digital index is expected to increase the number of tourists by 0.96% and revenues by 1.97% respectively. Chen et al. (2021) studied the impact of the number of tourists, GDP per capita, and traffic conditions on tourism income. A 1% increase in the number of tourist arrivals leads to a rise in revenue from tourism by an average of 1.56%.

The following hypotheses were put forward based on the bibliographic review:

Hypothesis 1: The costs of digitalization have a positive effect on the number of tourists;

Hypothesis 2: Transport Development Index (TDI) and Infrastructure Development Index (IDI) have a positive impact on the tourist flow in the Russian Federation;

Hypothesis 3: The number of tourists in the regions depends on the cost of tourism services.

Thus, this study is significant because it expands the previous ones, evaluating the impact on domestic tourism not only gross regional product, transport development index, the number of hotels, volume of services provided by hotels, but also infrastructure development index, the costs of implementing and using digital technologies, and the use of electronic document management.

Our study aims to assess the impact of introducing digital technologies and developing infrastructure and transport on domestic tourism.

Domestic tourism development in Russia is a relevant issue, since the tourist sphere is a favorable environment for the operation of small and medium-sized businesses, which form the foundation of the country's economy. It will lead to an increase in local incomes, the creation of new jobs and suitable infrastructure, which will improve the living standards of the population. The study was carried out using the R software environment.

2. Materials and methods

This study analyzes cross-sectional regional data of the Russian Federation for 2019. One of the most common regression analysis methods, the ordinary least squares (OLS), is used to measure the relationship between dependent and independent factors. The number of tourists in the region is chosen as a dependent variable, and the gross regional product (GRP), transport development index (TDI), infrastructure development index (IDI), costs of introducing and using digital technologies, use of electronic document management, number of hotels, amounts of services provided by hotels and health resorts, the quantity of paid tourist services, average year temperatures in the region, and sea access availability were chosen as explanatory variables. The research data description and designation are presented in Table 1.

Table 1 Data description

Designation	Units	Variables
Tourists	thousand people	Number of tourists in the region
TDI	units	Transport Development Index
Hotel	units	Number of hotels
Temperature	C°	Average annual temperature in the region
Sea	(1-access, 0- no access to the sea)	Access to the sea
IDI	units	Infrastructure Development Index
GRP	thousand roubles	Gross regional product
Tourism_serv	thousand roubles	Volume of paid tourist services
Hotel_serv	thousand roubles	Volume of services of hotels and health & fitness complexes
Electronic_doc	%	Use of electronic document management in organizations
Digital_tech_exp	thousand roubles	Costs of adoption and use of digital technologies

The generalized linear regression Equation would look like the following:

$$Tourists_i = \beta_0 + \beta_1 \cdot TDI_i + \beta_2 \cdot Hotel_i + \beta_3 \cdot Temperature_i + \beta_4 \cdot Sea_i + \beta_5 \cdot IDI_i + \beta_6 \cdot GRP_i + \beta_7 \cdot Tourism_serv_i + \beta_8 \cdot Hotel_serv_i + \beta_9 \cdot Electronic_doc_i + \beta_{10} \cdot Digital_tech_exp_i + \varepsilon_i$$

where i is the number of the region, β_0 is constant, β_1 - β_{10} are coefficients before variables, ε is an error.

3. Results and Discussion

In the course of the study, it was decided to transform some of the variables. Therefore, such variables as the number of tourists, GRP, IDI, TDI, costs of introducing and using digital technologies, electronic document management, hotels, services of hotels and health & fitness resorts, amounts of paid tourist services were converted by taking logarithms.

The sample is a set of data for 57 regions, other regions are not included in the analysis due to the lack of data. Table 2 presents descriptive statistics for the variables under consideration, namely 1 dependent and 10 explanatory.

Table 2 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Ln_tourists	57	6.35	0.99	4.25	9.65
ln_Digital_tech_exp	57	8.96	1.34	7.14	14.26
ln_Hotel_serv	57	14.65	1.12	12.89	18.23
ln_Hotel	57	5.54	0.78	3.26	8.54
ln_Tourism_serv	57	14.26	1.01	11.86	16.89
ln_GRP	57	13.59	0.94	12.19	16.79
Electronic_doc	57	67.50	4.68	58.5	81
Temperature	57	5.71	3.26	-3	13.2
TDI	57	3.29	1.08	2.43	8.38
IDI	57	5.76	0.41	5.07	7.77
Sea	57	0.25	0.43	0	1

Figure 3 shows the correlation matrix. It shows that the number of tourists has a high positive relationship with such indicators as costs of introducing and using digital technologies, the number of hotels, GRP, amounts of paid tourist services, hotels and health & fitness resorts, IDI and TDI. There is also a multiple positive correlation for other factors, and no solid negative association was found.

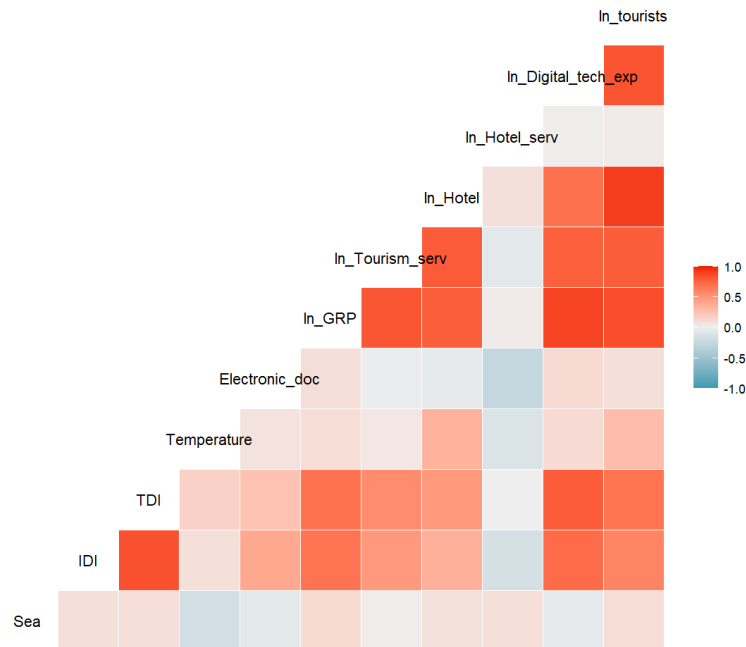


Figure 3 Correlation matrix

Two final models were built during the study (Formula 1-2, Table 3).

$$Ln_{Tourists}_i = -0.358 + 0.184 \cdot TDI_i + 0.856 \cdot ln_{Hotel}_i + 0.152 \cdot ln_{Digital_tech_exp}_i \quad (1)$$

According to the first model, a 1% increase in the costs of launching and using digital technologies corresponds to an increase in the number of tourists in the region by 0.15%. A 1% rise in the number of hotels in the region relates to the rise in the number of tourists by 0.86%, and 1 unit rise in TDI corresponds to an increase by 20.2%.

$$Ln_{Tourists}_i = -2.906 + 0.534 \cdot IDI_i + 0.903 \cdot ln_{Hotel}_i + 0.131 \cdot ln_{Digital_tech_exp}_i \quad (2)$$

According to the second model, a 1% increase in costs of launch and use of digital technologies and the number of hotels is associated with an increase in the number of tourists in the region by 0.13% and 0.9%, respectively. An increase in IDI by 1 unit

corresponds to a rise in the number of tourists by 70.5%, which is associated with a fairly small spread of IDI, as its minimum value is 5.07, and its maximum value is 7.77.

All coefficient estimates in the models are significant except for the constant. The constant has a negative value in both models but is insignificant in the first one.

Table 3 Comparison of final models (dependent variable – ln_tourists)

	Model 1	Model 2
(Intercept)	-0.358 (0.334)	-2.906*** (0.648)
ln_Digital_tech_exp	0.152* (0.061)	0.131* (0.057)
ln_Hotel	0.856*** (0.073)	0.903*** (0.072)
TDI	0.184** (0.063)	
IDI		0.534*** (0.142)
R-squared	0.913	0.920
Adjusted R-squared	0.908	0.915
F-statistic	184.5	202.4
Prob(F-statistic)	0.000	0.000
Max VIF	4.06	3.83

Significance: *** = $p < 0.001$; ** = $p < 0.01$; * = $p < 0.05$

Both models are significant, which confirms the Fisher criterion. The proportion of variance explained is 91% in the first model and 92% in the second one. Both models were tested for the OLS assumptions. So, all connections are more linear ones. All the errors are close to a normal distribution, but the second model errors are distributed more normally. The errors are relatively homoscedastic, so the maximum value of the variance inflation factor (VIF) is 4.06 in the first model and 3.83 in the second one.

The study tested three hypotheses. The first hypothesis was confirmed, as the costs of digitalization were significant at 5% and showed a positive relationship with the number of tourists. The second hypothesis on the positive impact of TDI and IDI on the tourist flow was also confirmed, as these factors were significant at 1% and 0.1% levels. In addition, [Zhang & Ju \(2021\)](#), [Chen et al. \(2021\)](#) and [Frolova \(2015\)](#) considered that developing transport infrastructure in regions and countries is significant and has a positive impact on the influx of tourists. This is logical, as the more developed the transport system is in the region, the better is the accessibility of recreational resources and places. The third hypothesis was not reflected in this study, since the cost of tourism services had to be excluded from the model because of its multicollinearity. However, according to the correlation analysis, the number of tourists and this factor are positively related. However, [Kozlov \(2015\)](#) revealed a negative relationship between the cost of tourism services and the dependent variable, but [Vorobey \(2021\)](#) also noted their positive relationship in her work.

4. Conclusions

Development of the domestic tourism is closely related to the spread of digital technologies in the regions and infrastructure development. Final models included IDI / TDI, costs of using digital technologies and a number of hotels of all the considered exogenous factors, as these factors have positive relationships with the number of tourists in the region. Russian regions have the remarkable capacity to promote tourism, as there are all the prerequisites for tourism development, such as natural and recreational

resources, rich history and distinctive culture. However, currently it is necessary to allocate funds for the development of transport infrastructure as well as to increase tourist flows within the country, namely in the road and rail sectors. The introduction of digital technologies in tourism significantly improves the efficiency of business processes and helps to attract tourists to the regions. Nowadays it is difficult to imagine our life without interactive maps, and special applications where we can quickly and easily find a building and its history, buy tickets or book a hotel room. It is worth noting that digitalization in tourism is also associated with promoting and increasing the recognition of separate entities of the Russian Federation. Consequently, the more investment is made in the development of digital tourism in the regions, the more attractive it becomes. The results of this study can be aimed at the development of regional policy instruments in order to increase the flow of domestic tourists and the socio-economic development of the territories. Further research will be targeted at clarifying demand factors and building a dynamic demand model.

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