

# Formation of Scenarios for The Development of The Tourism Industry of Ukraine With The Help of Cognitive Modeling

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## Abstract

The tourism industry is influenced by a large number of factors that affect the development scenarios of the tourism in different ways. At the same time, tourism is an important component of the national economy of any state, forms its image, investment attractiveness, is a source of income and a stimulus for business development. The aim of the article is to conduct an empirical study to identify the importance of cognitive determinants in the development of tourism. The study used general and special methods: systems analysis, synthesis, grouping, systematization, cognitive modeling, cognitive map, pulse method, predictive extrapolation. Target factors, indicators, and control factors influencing the development of tourism in Ukraine are determined and a cognitive model is built, which graphically reflects the nature of the influence of these factors. Four main scenarios of the Ukrainian tourism industry are established on the basis of creating a matrix of adjacency of an oriented graph and forecast modeling based on a scenario approach. The practical significance of the obtained results lies in the possibility of their use to forecast the prospects of tourism development in Ukraine, the definition of state policy to support the industry that will promote international and domestic tourism.

## Key words:

*tourism, methodology, cognitive modeling, factors of influence, cognitive map, development scenarios.*

## 1. Introduction

Tourism accounted for about a tenth of the growth of the global economy. In recent years, the industry has even been called its global driver. It is expected to grow much faster than the world economy in general. The World Travel and Tourism Council (2021) called on the country's leadership to pursue policies aimed at supporting and stabilizing the sector that is the driving force of the world economy and is responsible for creating one in five of all new jobs.

Today, the pandemic of acute respiratory disease COVID-19, caused by the coronavirus SARS-CoV-2, has become a factor that has forced the world to rethink its existence, reconsider not only its development forecasts, its short-term economic and social policy, but also realize that a new stage is beginning, on which it is necessary to change approaches to the formation of priorities for the long term. The tourism industry is one of the most affected by the restrictive measures caused by the spread of the COVID-19 pandemic. The coronavirus

pandemic has affected all tourist destinations in the world and has caused the strictest travel restrictions in history.

The latest survey of the United Nations World Tourism Organization (UNWTO, 2021) shows that international tourism prospects improving slightly. Overall, 60% of UNWTO experts expect a rebound in international tourism only in 2022. Nearly half of the experts do not see a return to before-pandemic levels before 2024 or later.

This uncertainty in the development of tourism in the world makes it important to study possible forecasts and scenarios that can help determine the prospects for the development of the industry, develop appropriate public policies, help businesses with positive and negative developments in tourism. Cognitive modeling is one of the important tools for determining the factors influencing a particular process which is used not only in the study of processes at the microeconomic level but also in the analysis of socio-economic processes of various sectors of the economy. So, it is appropriate to use cognitive modeling to prognoses the development of Ukrainian tourism and to identify the interaction of influencing factors among themselves.

Cognitive models have several advantages compared to statistics:

- they provide descriptions of the cognitive process that underlie behavioral responses in specific tasks;
- model parameters can be interpreted objectively and formally;
- model parameters can be used to quantify individual differences in specific cognitive processes based on the basic architecture of the model.

The purpose of the research is to apply the methodology of cognitive modeling to identify factors influencing the development of tourism, the degree of influence of factors, and the formation of development scenarios to identify the most likely events in order to improve the functioning of tourism in Ukraine.

## 2. Literature review

In complex sectors such as hospitality and tourism, various factors, indicators, conditions, attributes, attractors, contributing to the competitiveness of destination, will considerably vary in their significance across places depending on different states. The models may boost the tourism sector for a country by increasing the value that tourists will enjoy when visiting (Papadopolou, 2020).

To guarantee the durability of tourism, countries, that are most dependent on it, should firstly: design, estimate, and implement tourism projects with added value for tourists. Secondly, but also important, the tourism project must be sustainable and continuing. Thirdly, tourists always tend to choose, for safety's sake, those countries linked to solid and democratic institutional frameworks. Fourthly, the education of society must be a strict priority at the heart of a good tourism model. At last, as mentioned by Morales (2020), among the factors, that can be considered relevant for the correct performance of a good tourism model, we should not forget about digitalization.

Zhertovskaja and Yakimenko (2020) proved importance of tourist recreational clusters transformation using the innovative technological solutions on the way to achieving sustainable development of the tourist recreational complex of the region. Assaf et al. (2019) introduced a comprehensive and accurate systematic approach to tourism demand analysis, based on a Bayesian global vector autoregressive (BGVAR) model on the empirical data from nine countries in Southeast Asia. The potential of the BGVAR model in future applications is demonstrated by its superiority in both modeling and forecasting tourism demand.

The importance of forecasting method for tourist industry is considered in different researchers' results (Petrevska, 2017; Nor et al., 2016; Mei, 2015; Mai and Smith, 2018). But, according to Ghalekhonda (2019), there is a lack of study on the importance of appropriate data for forecasting purposes.

Joseph S. Chen (1998) analyzed the decision-making process, called the Tourists' Cognitive Decision Making (TCDM) model for the purpose of identifying and understanding the cognitive process of trip decision making. He proved that, unlike traditional decision-making models, the TCDM model incorporates latent influence, along with problem formulation, information search, evaluation, and implementation into its framework. Anokhina et al. (2019) used cognitive modeling to determine the parametric content of the management system of economic growth of agriculture and to form a strategy for achieving the target parameters of economic dynamics of the industry.

Farrell S. and Lewandowsky S. (2018) noted that the cognitive model can provide mathematically controlled

quantification of a particular cognitive process. In particular, it translates explicit verbal theories of the cognitive process into specific tasks in the mathematical formulation of these theories. Heathcote A., Brown S., and Wagenmakers E. (2015) proved that in a cognitive model, behavioral measures within a task are described as the result of different interacting processes or parameters of the model. The detailed interaction of these processes is defined in the architecture of the model and is an assumption that the model makes in relation to a particular cognitive process.

Thus, the cognitive model is a formalized theory of the cognitive process, which objectively states which parameters of the cognitive process affect the differences in observed behavior under conditions or individuals. The adequacy and validity of this formalization can be assessed by studying the restoration of parameters and testing the selective effects of a theoretically controlled experiment of manipulation of model parameters.

According to the results of generalization of views of scientists and scholars and analysis of the current state of tourism in Ukraine, its development in our country has been significantly influenced by demographic, socio-economic and technological changes. Considering these processes and the number of factors influencing the development of tourism in Ukraine, it is necessary to determine the extent of the impact of these factors on the overall development of tourism in the transformation process, taking into account the impact of tourism on the national economy. Therefore, an empirical study was conducted to identify the importance of cognitive determinants in the development of tourism with the formation of a cognitive model of influencing factors and the construction of a cognitive map.

### 3. Methodology

Determination of factors influencing the tourist industry in Ukraine, is based on methods of analysis and synthesis. The model of factors influencing the development of tourism in Ukraine is improved based on the application of cognitive modeling methodology, cognitive mapping and systems analysis. To analyze and construct a cognitive map, we determine the target factors, indicators and control factors (see Table 1).

**Table 1.** Factors influencing the development of tourism in Ukraine

Factors	
Target factors	V10 – efficient use of tourist infrastructure. V1 – business climate in tourism. V11 – efficiency of use of personnel potential in tourism
Indicators	V4 – qualification of staff in the tourism industry (experience, professionalism and education). V5 – level of development of tourist infrastructure. V2 – competition in the tourism industry. V9 – the level of migration in the labor market of personnel engaged or working in the tourism industry
Control factors	V12– State (governmental) policy (regulatory framework, tax policy, visa regime, state support of innovative types of tourism). V3 – age structure of the population and birth / death rate in Ukraine. V7 – information support in the field of tourism on integration into the world information tourist network. V6 – trends in socio-economic processes of Ukraine (unemployment rate, migration level, inflation, disposable income, level of urbanization - the number of urban and rural population). V8 – investments in the tourism industry (material and technical base, personnel and social security)

For pulse modeling we used the creation of an adjacency matrix of a directed graph. Therefore, it was necessary to define the following: the directed graph is  $G = (V, E)$ , where  $V$  is the set of vertexes (state points) corresponding to the set of parameters of the external and internal environment,  $E$  is the set of arcs reflecting the direct influence of the parameters on each other. In the pulse modeling process, we determine the vertices  $X_1$ – $X_7$ , which correspond to the simulation cycles according to the formula (simulation cycles reflect the possible development of factors, the most optimal option is to determine to  $X_6$  or  $X_7$ ):

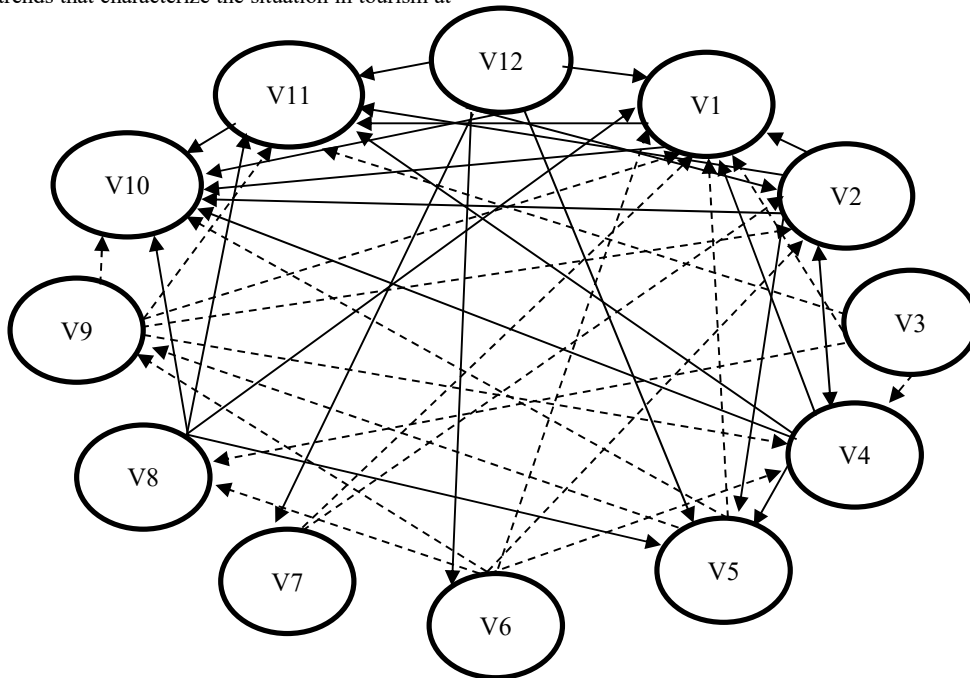
$$X_1^T = X_0^T + P_1^T = (0,0,0,0,0,0,0,0,0,0,0,0) + (0,0,1,0,0,0,0,0,0,0,0,0).$$

Forecasting modeling is based on a scenario approach, reflects a set of trends that characterize the situation in tourism at

the moment, the desired development goals, a set of measures influencing the development of tourism in Ukraine, and observation systems that reflect the behavior of tourism development in Ukraine. The results of previous studies were used in constructing the model (Shelemetieva T., Hres-Yevreinova S., Mamotenko D. 2020).

#### 4. Results

Factors influencing the development of tourism in Ukraine are presented with the help of cognitive modeling. It is worth noting that they all also affect each other. The model of influencing factors is designed in the form of a cognitive map (Fig. 1).



**Fig. 1.** Cognitive model of factors influencing the development of tourism in Ukraine (straight line - positive impact, dotted line - negative impact, no lines - no impact)  
Developed by the authors

The presented cognitive model of factors influencing the development of tourism in Ukraine reflects: *target factors*, restructuring or stabilization of which is the goal of tourism development in Ukraine (efficiency of tourism infrastructure, business climate in tourism, efficiency of human resources); *indicators* that reflect or explain the development of problematic situations in the tourism industry in Ukraine (qualification of personnel, level of infrastructure development, competition, level of migration in the labor market of personnel working in the tourism industry); *control factors* - potentially possible levers of influence on

the development of tourism in Ukraine (state policy, age structure of the population and birth / death rate in Ukraine, information support in tourism on integration into the global tourist information network, trends in socio-economic processes of Ukraine, investment in tourism industry).

Cognitive map reflects the influence of factors on each other: negative - reflected by a dotted line; positive – direct line; absence of any line - absence of influence.

The results of constructing the adjacency matrix of the oriented graph are shown in table 2.

Table 2. Adjacency matrix

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12
V1	0	0	0	0	0	0	0	0	0	1	1	0
V2	1	0	0	1	1	0	0	0	0	1	1	0
V3	-1	0	0	-1	0	0	0	-1	0	0	-1	0
V4	1	1	0	0	1	0	0	0	0	1	1	0
V5	-1	0	0	0	0	0	0	0	-1	-1	0	0
V6	-1	-1	0	-1	0	0	0	-1	-1	0	0	0
V7	-1	-1	0	0	0	0	0	0	0	0	0	0
V8	1	0	0	0	1	0	0	0	0	1	1	0
V9	-1	-1	0	-1	0	0	0	0	0	-1	-1	0
V10	0	0	0	0	0	0	0	0	0	0	0	0
V11	0	0	0	0	0	0	0	0	0	1	0	0
V12	1	1	0	0	1	1	1	0	0	1	1	0

The modeling itself, based on the scenario approach, reflects a set of trends that characterize current situation in tourism, the desired development goals, a set of measures influencing the development of tourism in Ukraine, and observation systems that reflect the behavior of tourism development in Ukraine.

#### Scenario 1. The impulse reaches the top V8.

The amount of investment in the tourism industry of Ukraine (V8) (material and technical base, personnel and social security) is characterized by the existing demand for the need for significant investments in all areas of tourism in Ukraine (see Fig. 2).

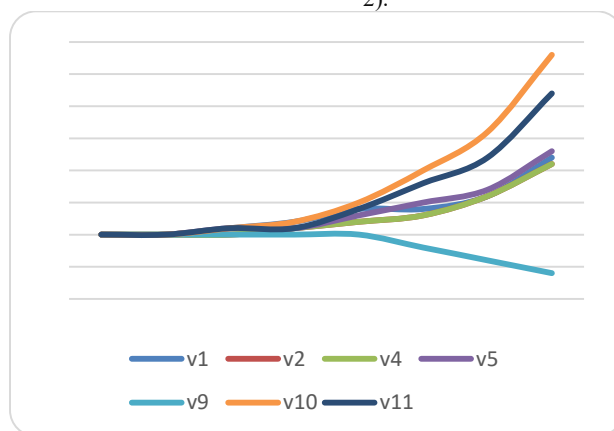


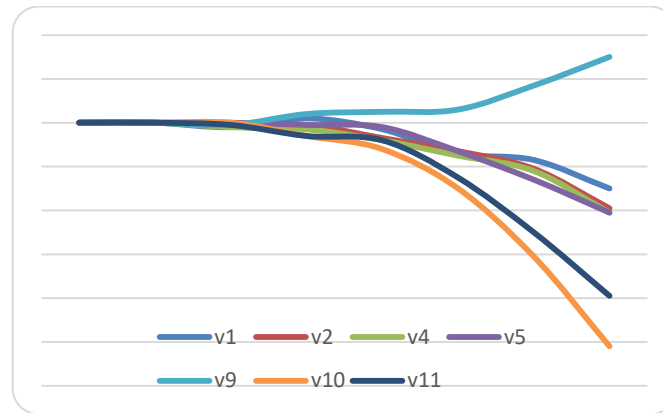
Fig. 2. Scenario 1 of tourism development in Ukraine, the impulse reaches the vertex V8

This situation generally characterizes the current situation in tourism in Ukraine. The lack of significant investments has a negative impact on the efficiency of infrastructure and human resources, the state of the business climate in the field of tourism. A significant increase in this indicator occurs from the fourth step. In order to improve the efficiency of infrastructure and human resources, and business climate in tourism, first of all, you need to attract significant investment. This is a necessary and key condition for the development of tourism in Ukraine, taking into account modern technologies and innovations that require significant financial inflows, but in the future, it will provide comfort, convenience

and growth of direct contribution of tourism to GDP and budget revenues.

#### Scenario 2. The impulse enters the two vertexes V7, V12

Unfortunately, Ukraine, as a tourist destination, is not as advertised and promoted as other countries, so factor V7 - information support in the field of tourism for integration into the global tourist information network – is important for stimulating tourist flows to Ukraine (see Fig. 3). However, there should be state support for the implementation of plans for increasing tourist flows, legislation, tax policy and support for key areas of the tourism industry in Ukraine.



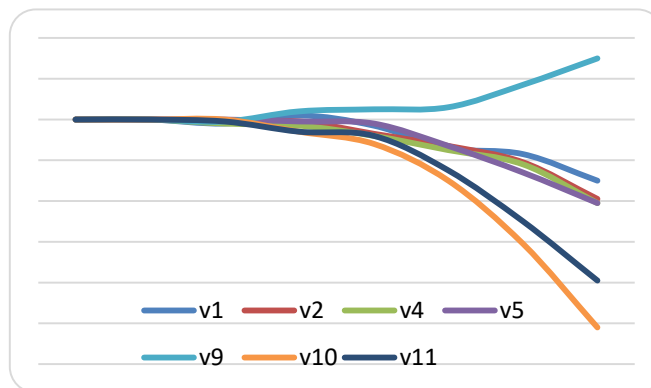
**Fig. 3.** Scenario of tourism development in Ukraine, the impulse goes to the vertices V7, V12

Increasing efforts to provide information in the field of tourism for integration into the global tourist information network will significantly increase the interest of tourists from all over Ukraine and from all over the world. Government support will be a significant stimulus for the growth of tourism development in the short-term perspective. In the third cycle of x3, the business climate improves, but in the future, there should be other tools, in particular, as noted in Scenario 1 - increase investment in tourism. At the beginning, the system reacts positively, but informing both the Ukrainian and the world community about Ukraine as a tourist-attractive country and state policy

can only promote its development. Without significant resources, all measures will not give the desired effect for tourism development. Thus, the need for investment in the industry has been proved again.

**Scenario 3. The impulse comes to the two vertices V3, V6**

V3 vector represents the age structure of the population and the birth / death rate in Ukraine, V6 vector represents trends in the socio-economic processes of Ukraine (unemployment rate, migration rate, inflation, disposable income, level of urbanization – the number of urban and rural population) (see Fig. 4).



**Fig. 4.** The scenario of tourism development in Ukraine, the impulse comes to the vertices V3, V6

One of the important issues in the development of tourism in Ukraine is changes in the age structure of the population and the birth/death rate in Ukraine. In particular, the increase in fertility and age structure should be in a certain parity with age categories. Another important factor is socio-economic trends, for example, the process of outbound migration has a significant impact on the further development of tourism in Ukraine, which is caused not only by internal factors in Ukraine, but significant attractiveness of other countries in social and

economic development. Development and stimulation of domestic tourism are of great importance

Summing up the analysis of graph (see Fig. 4), we can stipulate that the age structure and socio-economic trends largely depend on other factors and can not affect significant changes that contribute to the development of tourism in Ukraine. All factors of Scenario 3 are interdependent, as, for example, migration can be caused not only by interest in foreign countries, but also by finding a job and a better life due to unfavorable socio-economic conditions in the country (labor migration), the

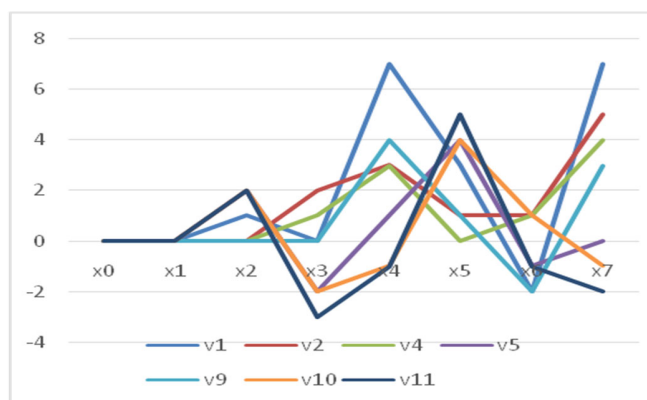
desire to get an education abroad for further employment in foreign countries (educational migration caused by the factor of unfavorable socio-economic conditions in the country)

**Scenario 4. The impulse comes to the three vertexes V7, V8, V12**

V7 vector represents information support in the field of tourism for integration into the global tourist information network. V8 vector represents investment in the tourism industry (logistics, staffing and social security). V12 vector represents

state policy (regulatory framework, tax policy, visa regime, state support for innovative types of tourism) (see Fig. 5).

The selected factors indicate the following: according to the given graph of impulse modeling, on the fifth step the efficiency of tourist infrastructure use, business climate in the field of tourism, efficiency of use of human resources in tourism increase significantly, but in the future, it is necessary to pay attention to other factors that may affect the development of tourism in Ukraine. This situation is characterized by normal cyclical processes in the national economy, which are characterized by both recessions and growth.



**Fig. 5.** Scenario of tourism development in Ukraine, the impulse comes to vertexes V7, V8, V12

Analyzing this graph (see Fig 5), it should be noted that the implementation of state policy with information support in the tourism industry in Ukraine and investment infusions will ensure significant development of tourism in Ukraine, promote Ukraine as a tourist attractive country in the international market and promote domestic tourism to provide jobs. growth in general.

It should be noted that four main scenarios for the development of tourism in Ukraine have been identified, such as: the need to attract investment to improve the efficiency of the use of tourist infrastructure and human resources, the business climate in tourism; the need to improve information support in the tourism sector for the positioning of Ukraine in the world and the formation of a positive tourist image; considerable attention needs to be paid to migration and the age structure of the population; government support is needed, which will be a significant stimulus for growth in the short term.

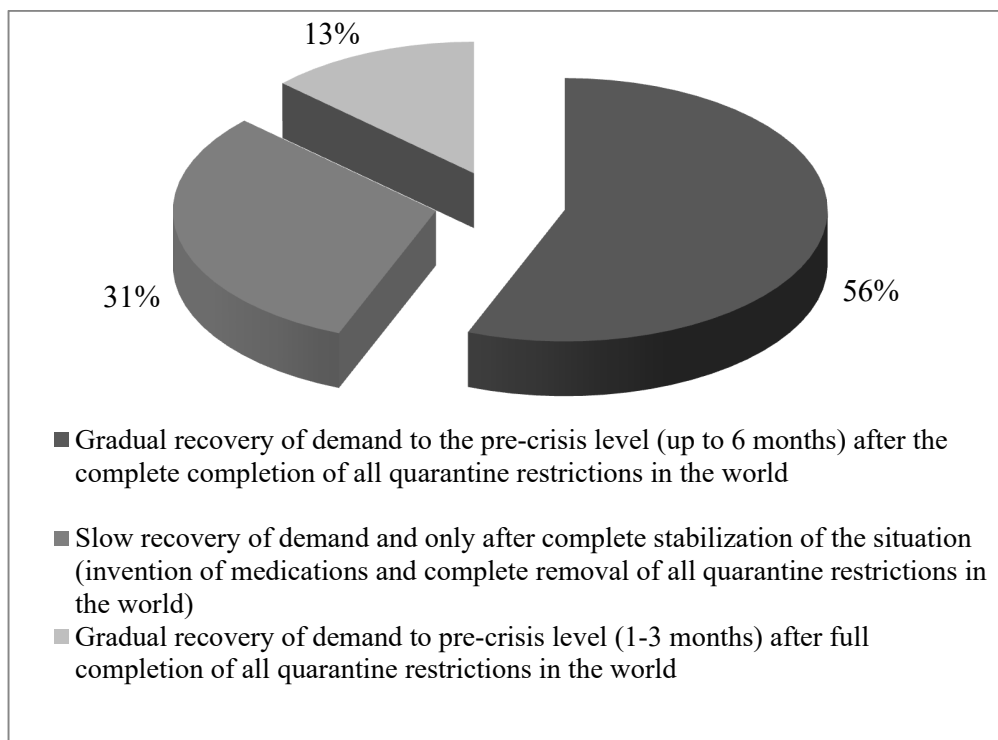
Sometimes tourism, like other industries, can be affected by factors that cannot be predicted. Such factors include, for example, the coronavirus pandemic, which has affected the entire world economy.

The Government of Ukraine estimates the losses of imports and exports of tourist services from the coronavirus

pandemic COVID-19 in 2020 at 1.5 billion USD. The Consensus Forecast "Ukraine in 2020-2021: Consequences of the Pandemic", prepared by the Ministry of Economic Development, Trade and Agriculture of Ukraine together with the UNICEF Office in Ukraine (2020), states that in about 6 months after the full completion of all quarantine restrictions in the world the demand of Ukrainians for international transportation and tourist services will be restored (see Fig. 6).

According to the survey conducted by the sociological group "Rating" in late May 2020, 66% of Ukrainians do not plan vacation at all, and only 30% answered in the affirmative to the question of the intention to go on vacation during summer 2020, 4% - hesitated. Among the reasons for the cancellation of the holiday - lack of funds - 44%; fear of contracting coronavirus - 21%. And only 26% of respondents did not plan a vacation this year at all.

The All-Ukrainian Association of Tour Operators notes "... about the situational surge of domestic tourism in Ukraine, which, however, cannot fully replace foreign ones due to higher prices on average and often worse service than in popular tourist countries".



**Fig. 6.** Restoration of demand from Ukrainians for international transportation and tourist services for 2020-2021

The Vodafone Ukraine company stated that during summer 2020 the number of subscribers in Ukrainian southern resorts had significantly increased compared to the summer of 2019: in Odesa, Mykolaiv and Kherson regions increased by more than 30% of tourists than on similar days last summer; in the resort of Kirilovka (Zaporizhzhia Region, the Sea of Azov) 55% more vacationers than in 2019; in the city of Berdyansk (Zaporizhzhia Region, the Sea of Azov) resort, probably 37% more than in 2019; in the Azov resorts of the Kyiv-controlled part of Donetsk Region increased by 100-170%.

## 5. Discussions

Various studies have tried to allocate appropriate attributes such as government policies, administration, and economic power to assess the future of tourism at national and international levels. The current study has established implementing different scenarios and government policies for national tourism development, but not considered the preservation of the ecosystem which can influence the number of tourist arrivals in a given country Papadopoulou G. (2020).

Our results corresponding to with findings of Zhertovskaja and Yakimenko (2020), which developed a system of factors for assessing the innovative development of the tourist recreational cluster and conducted cognitive modeling based on the scenario approach and impulse modeling, and identifying possible scenarios for the innovative development of the local tourist recreational cluster on the way to its

sustainable development in the context of global digital transformation.

The main advantages of cognitive modeling are the following: the formation of ideas about the socio-economic, demographic and political components of the impact on the overall development of tourism in Ukraine, as well as the identification of the interdependence between the factors of influence; formation of cognitive maps that graphically reflect the nature of the influence of factors.

The cognitive model made it possible to identify trends that characterize the current situation, the desired development goals affecting tourism development in Ukraine and taking them into account when substantiating the relevant management decisions on the effective and comprehensive use of the existing tourist and resort-recreational potential of the country, raising the level of the national economy and the implementation of foreign policy.

Jiao and Chen (2019) on the basis of studies in tourism demand considered forecasting models in three categories: econometric, time series, and artificial intelligence (AI models). Econometric and time-series models remained popular and are more often used as benchmark models for forecasting performance evaluation and comparison. Simultaneously AI models and hybrid AI models are rapidly developed and becoming a modern trend (Hirashima et al., 2017; Park et al., 2017). Ghalekhonda et al. (2019) claimed that there are no forecasting methods that can develop the best predictions given all the problems. But combined forecasting methods are fitting for better scenarios in comparison to the common methods.



We agree with the Assaf et al, that increasing levels of global and regional integration should be considered when modeling and forecasting international tourism demand within a region.

According to Morales (2020), there are more significant factors that can improve the effectiveness of world tourism models. Nevertheless, factors, mentioned above in our research, can be considered fundamental tools for the good representation of a tourism scenario model, as well as strategic patterns to make the Ukrainian tourism model a sustainable and solid pillar of our economy. Tourism will become an increasingly important and prevalent sector for different countries and the world economy. Therefore, the prospects of future research will be to find a way to make the predictive models the best, and the most competitive.

## 6. Conclusion

The development of the tourism industry is extremely important for Ukraine. The country has potential, a unique complex of historical, cultural and natural monuments, significant recreational opportunities attract more and more tourists, including foreign ones. But its economic impact is still insignificant. It is possible to ensure the proper return of this powerful potential, to use it for active recreation and health of people only with a clear organization of tourism, the introduction of effective mechanisms for management and regulation of the industry, attracting experienced and qualified personnel. Based on the world experience, in order for the tourism industry to become part of the national humanitarian policy and priorities, it's necessary to take into account tourism industry when considering other issues of national importance, the legislative and executive bodies should provide an interested approach to tourism development. Today, tourism is one of the sectors most affected by the coronavirus pandemic. The industry will work according to the new rules - both for countries that host vacationers and for tourists. Now the main rule of work will be safety for tourists and staff in the world and in Ukraine.

The tourism sector will be out of quarantine longer than others, because the first thing that citizens start to save on in the event of a crisis is vacation. Therefore, more than ever, the Ukrainian tourism sector is in dire need of State (Governmental) support. The implementation of the measures mentioned in the study will increase the efficiency of tourism development management, pursue an active regional policy in this area, ensure coordination of local executive bodies, local governments, NGOs and business, as well as increase tourist flows in the regional market of tourist services, organize new jobs, increase revenues to state and local budgets, promote the international prestige of Ukraine as a tourist state in the world market of tourist services.

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