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FACTOR MODEL OF THE SIGNIFICANT FACTORS IN THE MACRO ENVIRONMENT OF TOURISM ENTERPRISES

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Factor Model of the Significant Factors in the Macro Environment of Tourism Enterprises

The article is aimed at developing of a factor model based on significant factors in the macro environment of tourism enterprises. In the article the evaluation and analysis of the factors in the macro environment of tourism enterprises are conducted using the principal components method. The actuality of registration of the macroenvironment factors influences for the purpose of the effective operation of tourism enterprises is grounded. The main types of region's potentials are proposed, by which a reliable determination of the most influential factors in the macro environment can be facilitated, among them demographic, socio-economic, infrastructural (common and recreational), natural-ecological, historical and cultural factors. Using the correlation analysis a preliminary selection of the most influential factors in the macro environment is carried out. By using the principal components method the reduction of the influential factors in the macro environment is conducted and formation of the latent, principal components with the important elemental composition is grounded. Based on the calculated coefficient of the information content of the principal components, the interpretation with such content as «development of the material base of tourism», «paying capacity of the consumers», «marketing network of the tourist enterprises» is accomplished. With consideration for the obtained results a factor model of the significant factors in the macro environment with minimal loss of the information content was developed.

Keywords: *tourism enterprise, macroenvironment factors model, correlation matrix, reduction, main components, information content*

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Кулешова Н. В. Факторная модель значимых факторов макросреды туристических предприятий

Целью статьи является разработка факторной модели значимых факторов макросреды туристического предприятия. В статье проводятся оценка и анализ факторов макросреды туристических предприятий с использованием метода главных компонент. Обоснована актуальность учета влияний факторов макросреды с целью эффективного функционирования туристических предприятий. Предложены основные виды потенциалов региона, с помощью которых проводится объективное определение наиболее влиятельных факторов макросреды, среди которых демографический, социально-экономический, инфраструктурный (общий и рекреационный), природно-экологический и историко-культурный. С использованием корреляционного анализа проводится предварительный выбор наиболее влиятельных факторов макросреды. С помощью метода главных компонент осуществляется редукция полученных влиятельных факторов макросреды и обосновывается формирование латентных, главных компонент со значимым их элементным составом. На основании рассчитанного коэффициента информативности главных компонент осуществляется их интерпретация с таким содержанием, как «Развитие материально-технической базы туризма», «Платежеспособность потребителей», «Сбытовая сеть туристических предприятий». С учетом полученных результатов разработана факторная модель значимых факторов макросреды при минимальной потере информативности.

Ключевые слова: *туристическое предприятие, макросреда, факторы, модель, корреляционная матрица, редукция, главные компоненты, информативность*

Рис.: *1.* ***Табл.:*** *4.* ***Формул:*** *2.* ***Библ.:*** *16.*

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Кулєшова Н. В. Факторна модель значущих чинників макросередовища туристичних підприємств

Метою статті є розробка факторної моделі значущих чинників макросередовища туристичного підприємства. У статті проводяться оцінка та аналіз чинників макросередовища туристичних підприємств із використанням методу головних компонент. Обґрунтовано актуальність вираховування впливу чинників макросередовища з метою ефективного функціонування туристичних підприємств. Запропоновано основні види потенціалів регіону, за допомогою яких проводиться об'єктивне визначення найвпливовіших чинників макросередовища, серед них демографічний, соціально-економічний, інфраструктурний (загальний і рекреаційний), природно-екологічний та історико-культурний. З використанням кореляційного аналізу проводиться попередній вибір найвагоміших чинників макросередовища. За допомогою методу головних компонент здійснюється редукція визначених найвагоміших чинників макросередовища та обґрунтовується формування латентних, головних компонент із значущим їх елементним складом. На підставі розрахованого коефіцієнту інформативності головних компонент здійснюється їх інтерпретація з таким змістом, як «Розвиток матеріально-технічної бази туризму», «Платоспроможність споживачів», «Збутова мережа туристичних підприємств». З урахуванням отриманих результатів розроблено факторну модель значущих чинників макросередовища при мінімальній втраті інформативності.

Ключові слова: *туристичне підприємство, макросередовище, чинники, модель, кореляційна матриця, редукція, головні компоненти, інформативність*

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Introduction. Effective functioning of domestic tourism enterprises depends on the degree of influence of factors of the marketing environment, including factors that are not controlled by them. A high level of variability, uncertainty and instability are the properties that are inherent to the factors of the macro environment. Today, leaders of local tourism enterprises should pay enough attention to the comprehensive analysis of macro environment factors to determine their elemental composition and overall impact. Neglect of this will result in the inability to timely adapt tourism activities to changing conditions that affect the loss of customers, loss of income and, consequently, lead to a complete withdrawal from the market of tourist enterprises.

Issues devoted to the study of macro environment factors of the tourist enterprises are covered in the works of well-known foreign and domestic scholars, namely F. Kotler, J. Bowen, J. Meykenz [1], J. K. Holloway [2], N. K. Moyiseyeva [3], O. M. Azarian [4], L. M. Shulgina [5] and others. However, the absence of a unified approach to the objective of forming in the literature, organizing quantitative indicators of macro environment and common methods for determining the most influential factors of macro environment complicate the evaluation of their impact on the tourism enterprises in order to develop an effective marketing strategy.

Therefore, the **aim** of the article is to develop a factor model of important agencies of the tourist enterprise macro environment.

The main material. Under macro environment of a tourist enterprise we mean a set of factors that shape the long-term profitability of tourism enterprises and carry out an indirect effect on its activity and the possibility of successful competition in the market [5].

According to the flowchart of the complex relationship models the formation of marketing strategy of tourism enterprises that was developed within [6] stage of identifying the factors of macro environment is presented by model 1.1, which aims to develop information on important factors macro environment and the degree of impact on the tourism business. Determination of influential factors of a tourist enterprise macro environment is proposed according to the developed algorithm, which is described in detail in [7]. As the objects of the study the regions of Ukraine were selected. This choice was made based on the assumption that tourism businesses operates within a specific region. Therefore the elemental composition of macro environment and its effect do not change both for the region and for the tourist business. The initial data for this analysis were the statistical parameters characterizing the demographic, socio-economic, infrastructural (general and recreational), natural and ecological, historical and cultural potential of the region for 2006–2010. [8–14]. Given study period is due to the possibility of comparison of statistical data both macroeconomic and tourism, which is associated with a change in the form of their presentation in subsequent periods. In addition, this period covers the behavior of statistical indicators during the global financial crisis and the gradual exit from it. As initial, generalized indicator of tourism in regions the volume of provided tourist services was selected (y), since this indicator reflects the level of tourism activity in the regions of Ukraine. Implementation of the model was performed using the package STATISTICA 7.0.

In the first stage, based on the analysis of literature and statistical sources [1–5] a large number of all factors potentials mentioned above have been analyzed. However, due to limited access to the quantitative and based on analysis of statistical sources 69 of those were selected that affect the change in the volume of tourism in the region. On the basis of this analysis the matrixes of input data for 2006–2010 were formed. On the next step a correlation matrix R_{yq_j} was calculated for 2006–2010 and indicators were selected the correlation of which with the initial y is significant and corresponds to a certain grading [15]. The analysis of these results allowed concluding that over the period 2006–2010 the impact of important factors is not sustainable. But still there is a steady group of factors that do not change their effect on the volume of tourism in the region over the period. Representatives of this group are: investment in fixed assets of hotels, foreign direct investment in hotels and other places of temporary stay, number of tourist enterprises that rendered services, spa and wellness facilities, number of beds in health resorts, the number of places in health camps, the number of sea and river ports, parks and nature reserves. Thus, according to the above results a matrix of the most important factors for each year was formed (Table 1)..

At the stage of creation of evaluation model of important factors of tourist enterprises a reduction of the most important factors matrix was conducted to reduce the information space using the method of principal components. Formalized type of the model can be represented as follows [16, p. 349]:

$$F_r = \frac{1}{\lambda_r}(a_{1r} \times z_{l1} + a_{2r} \times z_{l2} + ... + a_{mr} z_{lm}), \quad (1)$$

where $a_{1r}, a_{2r} ... a_{mr}$ – elements of column r for the r principal component of factor load matrix A;

$z_{l1}, z_{l2} ... z_{lm}$ – standardized value of l index;

λ_r – the actual value of r principal component.

Note that the definition of the most important factors of macro environment was conducted separately for each period, starting in 2006 and ending with the year 2010 in order to identify significant factors for sustainable part of the macro environment. Application of principal component allowed reduction of the information space from 14 to 3 factors in 2006, from 16 to 3 factors in 2007 and 2008 and from 12 to 3 factors in 2009 and 2010. Reducing the information space to 3 factors was conducted on the basis of Kaiser and Cattell criteria. As an example, the number of factors for 2010 was determined by usage of Cattell's criterion based on the creation of a graph of a rock slide (Fig. 1).

In order to improve the structure of the obtained factors the inversion of matrixes of factor display Varimax and Biquartimax were applied and the main factors were formed within 2006-2010., significant elements of which are presented in Table. 2.

In order to exercise a reasoned choice of important factors of macro environment of a tourist enterprise, we have analyzed the stability of the elements of the principal components over the 2006-2010 period, the results of which are shown in Table 3.

Table 1

The results of choosing the most important factors by the correlation matrix (R_{yqj}) in 2006 – 2010

Group of factors	Content of indices	Conventional signs	Meaning R_{yqj}
1	2	3	4
2006			
Demographic	Working population, people	x_1	0,45
	Index of the arrived foreign, people	x_2	0,91
	Index of the departed foreign, people	x_3	0,62
Social and Economic	Investments into main hotel capital, thousands hryvnjas	x_4	0,9
	Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	x_5	0,9
Infrastructure	Number of tourist agencies, that provided services, unit	x_6	0,91
	Capacity of hotels, rooms	x_7	0,8
	Retail stalls of enterprises, units	x_8	0,4
	Resort and recreational places, units	x_9	0,73
	Resort and recreational places , units	x_9	0,73
	Number of beds in resort places, units	x_{10}	0,84
	Number of rooms in resort camps for kids, units	x_{11}	0,64
	Number of sea and river ports, units	x_{12}	0,78
Nature and ecology	Number of parks, units	x_{13}	0,79
	Natural reserves, units	x_{12}	0,76
2007			
Demographic	Population, people	x_1	0,52
	Working age population, people	x_2	0,49
	Index of the arrived foreign, people	x_3	0,63
	Index of the departed foreign, people	x_4	0,59
Social and economic	Average monthly pay, thousands hryvnjas	x_5	0,46
	Investments into main hotel capital, thousands hryvnjas	x_6	0,71
	Investments into main restaurant capital, thousands hryvnjas	x_7	0,84
	Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	x_8	0,82
	Unemployment rate, %	x_9	-0,51
Infrastructure	Number of tourist agencies, that provided services, units	x_{10}	0,88
	Resort and recreational places , units	x_{11}	0,69
	Number of beds in resort places, units	x_{12}	0,77
	Number of rooms in resort camps for kids, units	x_{13}	0,60
	Number of sea and river ports, units	x_{14}	0,73
Nature and ecology	Number of parks, units	x_{15}	0,83
	Natural reserves, units	x_{16}	0,68
2008			
Demographic	Population, people	x_1	0,50
	Working age population, people	x_2	0,44
	Index of the arrived foreign, people	x_3	0,42
	Index of the departed foreign, people	x_4	0,41

End of table 1

1	2	3	4
Social and economic	Average monthly pay, thousands hryvnjas	x_5	0,44
	Investments into main hotel capital, thousands hryvnjas	x_6	0,74
	Investments into main restaurant capital, thousands hryvnjas	x_7	0,55
	Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	x_8	0,88
	Unemployment rate, %	x_9	-0,61
Infrastructure	Number of tourist agencies, that provided services, units	x_{10}	0,84
	Resort and recreational places, units	x_{11}	0,64
	Resort and recreational places, units	x_{12}	0,75
	Number of rooms in resort camps for kids, units	x_{13}	0,57
	Number of sea and river ports, units	x_{14}	0,73
Nature and ecology	Number of parks, units	x_{15}	0,83
	Natural reserves, units	x_{16}	0,66
2009			
Demographic	Index of the arrived foreign, people	x_1	0,63
Social and economic	Investments into main hotel capital, thousands hryvnjas	x_2	0,80
	Investments into main restaurant capital, thousands hryvnjas	x_3	0,77
	Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	x_4	0,63
	Unemployment rate, %	x_5	-0,43
2009 рік			
Infrastructure	Number of tourist agencies, that provided services, units	x_6	0,67
	Resort and recreational places, units	x_7	0,57
	Number of beds in resort places, units	x_8	0,80
	Number of rooms in resort camps for kids, units	x_9	0,50
	Number of sea and river ports, units	x_{10}	0,61
Nature and ecology	Number of parks, units	x_{11}	0,62
	Natural reserves, units	x_{12}	0,69
2010			
Social and economic	Average monthly pay, thousands hryvnjas	x_1	0,41
	Investments into main hotel capital, thousands hryvnjas	x_2	0,69
	Investments into main restaurant capital, thousands hryvnjas	x_3	0,81
	Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	x_4	0,65
	Unemployment rate, %	x_5	-0,42
Infrastructure	Number of tourist agencies, that provided services, units	x_6	0,69
	Resort and recreational places , units	x_7	0,53
	Number of beds in resort places, units	x_8	0,78
	Number of rooms in resort camps for kids, units	x_9	0,44
	Number of sea and river ports, units	x_{10}	0,60
Nature and ecology	Number of parks, units	x_{11}	0,58
	Natural reserves, units	x_{12}	0,70

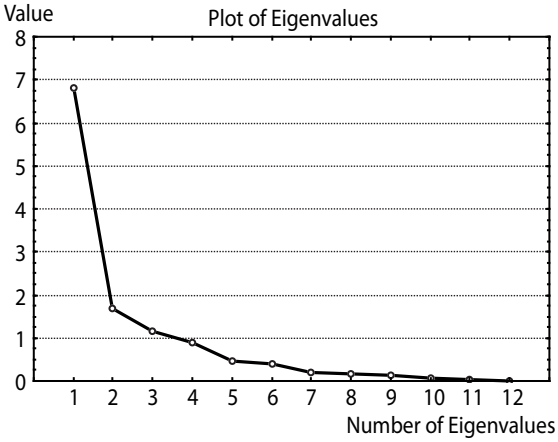

Fig. 1. The graph of a rock slide for determining the number of factors in 2010

Table 3 shows that during the studied period, the most common indicators of impact on the region's tourism businesses were investing in main capital of hotels and the number of tourist agencies rendering services. The second group of stable elements of principal components are indicators of foreign direct investment in hotels and other places of temporary residence, investment in fixed assets of restaurants, number of beds in resorts, amount of sea and river ports, nature reserves, unemployment rate, spa and wellness facilities. The third group, which also can be described as satisfactory stable the numbers of rooms in resort camps for kids and average monthly pay. Based on these parameters, we define the frequency of their manifestations for each year (Table 4).

Table 4 shows that a fairly complete composition of stable elements of principal components can be found in 2007 and 2010. In this regard, further study will be based on a factor model, built on 2010, containing the updated values

Table 2

Significant elemental composition of the main components within 2006–2010

Years	Factor	Significant elements of the main component	Factor load	General dispersion, explained by the factor, %
1	2	3	4	5
2006	F_1	Investments into main hotel capital	0,93	53,00
		Direct foreign investments into hotels and other places of temporary stay	0,93	
		Number of tourist agencies, that provided services, units	0,93	
		Hotels capacity	0,92	
		Number of beds in resort places	0,75	
		Number of sea and river ports	0,73	
		Number of parks	0,74	
		Natural reserves	0,82	
	F_2	Working age population	0,29	15,48
		Index of the arrived foreign	0,40	
		Index of the departed foreign	0,50	
	F_3	Retail stalls of enterprises	0,32	15,13
2007	F_1	Resort and recreational places	0,90	28,93
		Number of beds in resort places	0,85	
		Number of rooms in resort camps for kids	0,90	
		Number of sea and river ports (per 10 thousand km^2)	0,86	
	F_2	Investments into main hotel capital	0,27	27,58
		Investments into main restaurant capital	0,52	
		Direct foreign investments into hotels and other places of temporary stay	0,44	
		Number of tourist agencies, that provided services	0,45	
		Natural reserves	0,34	
	F_3	Population	-0,08	23,00
		Working age population	0,40	
		Average monthly pay	0,05	
		Unemployment rate	-0,20	

End of table 2

1	2	3	4	5
2008	F_1	Investments into main hotel capital	0,72	42,5
		Investments into main restaurant capital	0,77	
		Direct foreign investments into hotels and other places of temporary stay	0,84	
		Number of tourist agencies, that provided services	0,73	
		Resort and recreational places	0,95	
	F_2	Population	-0,01	22,01
		Average monthly pay	0,03	
		Unemployment rate	-0,39	
	F_3	Natural reserves	0,61	12,87
2009	F_1	Investments into main hotel capital	0,17	54,32
		Investments into main restaurant capital	0,41	
		Resort and recreational places	0,37	
		Number of beds in resort places	-0,18	
		Number of rooms in resort camps for kids	0,39	
		Natural reserves, units	070	
		Number of sea and river ports (per 10 thousand km^2)	0,97	
	F_2	Unemployment rate	-0,87	15,61
	F_3	Number of tourist agencies, that provided services	0,77	13,04
2010	F_1	Investments into main hotel capital	0,90	55,58
		Investments into main restaurant capital	0,92	
		Direct foreign investments into hotels and other places of temporary stay	0,86	
		Resort and recreational places	0,88	
		Number of beds in resort places	0,91	
		Number of rooms in resort camps for kids	0,78	
		Number of sea and river ports	0,92	
		Number of parks	0,78	
	F_2	Number of tourist agencies, that provided services	0,82	7,91
	F_3	Average monthly pay	0,84	11,79

of quantitative and best match their elemental composition of the main component resistant to certain groups. The structure of the first major component includes a significant factor loading indicators such as investment in fixed assets of hotels and restaurants, foreign direct investment in hotels and other places of temporary stay, spa and wellness facilities, number of beds in resorts, number of rooms in kids resorts, the number of sea and river ports, the number of parks. All figures describe the situation and development of material and technical base of tourism. In this regard, *F*1 will be called "Development of material and technical base of tourism." The second component (*F*2) contains only one element with a significant load factor – the number of tourist agencies that provided services. Therefore, the correct name of the *F*2 can be formulated as "a marketing network of travel products." The third component (*F*3) consists of indicators characterizing the average monthly pay and unemployment of the population, which allows to interpret it as "Solvency of the population."

In order to justify ongoing interpretation of principal components the coefficient of informativeness (K_r) will be calculated by the formula [16, p. 358]:

$$K_r = \frac{\sum\limits_{j} a_{jr}^2 \{W_2 - W_1\}}{\sum\limits_{j=1}^{m} a_{jr}^2},$$

where a_{jr} is the load factor of *r* principal component;

W_2 is a subset of significant factor loading of principal component *r*;

W_3 is a subset of important factor that does not participate in the formation of names of *r* principal component;

$\{W_2 - W_3\}$ is a subset of significant factor loading that is involved in the formation of names of *r* principal component.

Table 3

Resistance of elements of principal components over the 2006–2010 period

№	Indices	Frequency
1	Investments into main hotel capital, thousand hryvnjas	5
2	Number of tourist agencies, that provided services, units	5
3	Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	4
4	Investments into main restaurant capital, thousands hryvnjas	4
5	Number of beds in resort places, units	4
6	Number of sea and river ports (per 10 thousand km^2), units	4
7	Natural reserves, units	4
8	Unemployment rate, %	4
9	Resort and recreational places, units	4
10	Number of rooms in resort camps for kids, units	3
11	Average monthly pay, thousands hryvnjas	3
12	Population, people	2
13	Number of parks, units	2
14	Retail stalls of enterprises, units	1
15	Index of the departed foreign, people	1
16	Index of the arrived foreign, people	1
17	Capacity of hotels, rooms	1
18	Working age population, people	1

Table 4

The frequency of the indices as the part of the main component for 2006–2010

Indices	Years				
	2006	2007	2008	2009	2010
Investments into main hotel capital, thousand hryvnjas	+	+	+	+	+
Number of tourist agencies, that provided services, units	+	+	+	+	+
Direct foreign investments into hotels and other places of temporary stay, thousands hryvnjas	+	+	+		+
Investments into main restaurant capital, thousands hryvnjas		+	+	+	+
Number of beds in resort places, units	+	+		+	+
Number of sea and river ports (per 10 thousand km^2), units	+	+		+	+
Natural reserves, units	+	+	+	+	
Unemployment rate, %		+	+	+	+
Resort and recreational places, units		+	+	+	+
Number of rooms in resort camps for kids, units		+		+	+
Average monthly pay, thousands hryvnjas		+	+		+
Amount	**5**	**11**	**7**	**9**	**10**

So, in our case, the coefficients of informativeness (K_r) for the first principal component ($F1$)::

$$K_1 = \frac{0,81+0,85+0,73+0,78+0,83+0,61+0,85+0,61}{0,08+0,81+0,85+0,73+0,13+0,05+0,78+0,83+0,61+0,85+0,61+0,34} = 0,82;$$

for the second principal component ($F2$):

$$K_2 = \frac{0,68}{0,0018+0,015+0,074+0,0006+0,11+0,68+0,02+0,003+0,0025+0,00005+0,0023+005} = 0,75;$$

for the third principal component (*F*3):

$$K_3 = \frac{0,71+0,53}{0,71+0,0003+0,01+0,01+0,53+0,03+0,03+0,003+0,07+0,01+0,01+0,0002} = 0,87.$$

The obtained values of coefficient of informativeness for each of the main components satisfy its boundary values 0,75–0,95, that indicate the reliability of the generated subsets of significant factor loading and validity of the names of the principal components that were previously defined.

Thus, according to the data in table 2, in 2010 the largest part of the total variance of end indices is explained by the main component *F*1 – "Development of material and technical base of tourism." Also a significant factor is the *F*3 – «Solvency of consumers", which plays a significant role in shaping the demand for tourist services. This result does not contradict the reality, because the development of quality recreational and general infrastructure attracts not only domestic tourists but also foreign, thereby increasing the total volume of services provided by travel companies and maintaining and increasing the financial capital of the region. Certainly, it is clear that with increasing incomes it becomes possible to buy holiday in tourist agencies, thereby increasing the volume of services of tourism enterprises regions. In third place in importance is the *F*2 factor, which characterizes the distribution network of tourism products, which is the main representative of tour operators, travel agents that directly create the volume of tourist services.

Therefore, according to formula (1) the factor model of significant ICC factors for 2010 with minimal loss of information content, has the form:

$$\begin{aligned} F_1 &= \frac{1}{6,80} \times (0,90 \times z_{20} + 0,92 \times z_{21} + 0,86 \times z_{22} + 0,88 \times z_{30} + \\ &+ 0,91 \times z_{31} + 0,78 \times z_{33} + 0,92 \times z_{35} + 0,78 \times z_{49}); \\ F_2 &= \frac{1}{1,69} \times (0,82 \times z_{25}); \\ F_3 &= \frac{1}{1,14} \times (0,84 \times z_{13} + 0,73 \times z_{23}), \end{aligned} \quad (2)$$

where *z*13 – standardized index of the average monthly pay;

*z*20 – standardized value of investment into the main capital of hotels;

*z*21 – standardized value of investments into the main capital of restaurants;

*z*22 – standardized value of foreign direct investment in hotels and other places of temporary residence;

*z*23 – standardized value of unemployment;

*z*25 – standardized value of the number of tourist enterprises that provided services;

*z*30 – standardized value of the number of resort and recreational facilities;

*z*31 – standardized value of number of beds in resorts;

*z*33 – standardized value of the number of rooms in kids camp resorts;

*z*35 – standardized value of the number of sea and river ports (per 10 thousand km2);

*z*49 – standardized value of the number of parks.

Conclusion. Consequently, the proposed factor model of important factors of the macro environment of tourist enterprise can be used when managers of tourist enterprises are making strategic marketing decisions, particularly in developing marketing strategies, given the cumulative effect of macro environment factors such as the development of material and technical base of tourism, solvency of the population, the state distribution network of tourism products. The results obtained by the model will be applied during the development of a simulation model implementing marketing strategy for tourism businesses in future.

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