Clustering of regional tourism service markets according to indicators of the functioning of subjects of tourism activity

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Abstract. Clustering of regional tourism service markets of Ukraine is performed according to the indicators of functioning of subjects of tourism activity (number of subjects of tourism activity; number of stuff members of tourist activities; income from tourism; number of tourists served by tour operators and travel agents; cost of travel packages sold). The clustering was performed in the software STATISTICA 10, the Ward method was chosen as the clustering algorithm, and the Euclidean distance was chosen as a measure of distance. The calculations made it possible to distinguish 6 clusters of regional tourism service markets of Ukraine, which are formed at a threshold distance of 0.5, namely: cluster 1 is Kyiv city, cluster 2 is Zaporizhia, Kyiv, Poltava, Ivano-Frankivsk regions, cluster 3 is Dnipropetrovsk, Lviv regions, cluster 4 is Odesa, Kharkiv regions, cluster 5 is formed from Zhytomyr, Ternopil, Chernihiv, Kirovograd and Luhansk regions, cluster 6 unites Vinnytsia, Chernivtsi, Donetsk, Cherkasy, Transcarpathian, Rivne, Khmelnytsky, Volyn, Sumy, Kherson and Mykolaiv regions. The clusters on the vertical dendogram of hierarchical clustering are visualized, the spatial distribution of clusters of regional markets of tourist services is shown on the map of Ukraine. It is established that the high degree of regional differentiation of tourist service markets in Ukraine is caused by differences in the distribution of natural resources, climatic features of the regions, cultural and historical conditionality, and uneven placement of transport, communication, resort and entertainment infrastructures, asymmetrical distribution of recreational resources. It is suggested to take into account the restrictions of development of regional tourism service markets of Ukraine (clusters of regional tourism service markets) in terms of spatial polarization, to distribute them into internal (historically-formed basic and innovative determinants) and external ones.

Keywords: tourism, tourism service market, service sector, cluster analysis, subjects of tourism activity, tourism activity, spatial polarization
Introduction. The high degree of regional differentiation of the tourist service markets in Ukraine makes the usage of unified approaches to the tourism development management and regulation ineffective. The achieved strategic goals of the state policy in the field of tourism, coherences and satisfaction of interests of the tourism activity subjects and the state is possible through the development and implementation of optimal specific models of regional support to the development of business processes in the tourism industry. In this regard, the question of identifying clusters of regional tourist services markets of Ukraine similar in tendencies and indicators of tourism activity is urgent. The use of cluster analysis and profiling of each selected segment can serve as an informational and analytical basis for working out effective strategies and models for the development of regional tourism service markets.

The use of cluster analysis and clustering methods has become widespread in the tourism industry, both in the works of domestic scientists and foreign researchers. L. Golovkova, Yu. Yuhnovska (Golovkova, Yuhnovska, 2019) propose an algorithm for the formation and development of the tourism industry of the region on the basis of a cluster approach, insist that the structure of the tourism cluster of the region should be based on enterprises (organizations, firms) that are geographically located, tourist infrastructure, local labor markets and tourist product, which is a geographical and historical component of an appropriate region. The influence of tourism clustering on the formation of regional image, the spread of clustering processes through the promotion of the image of the territory is raised in the work of S. Kolyadenko (Kolyadenko, 2018). N. Andrusiak (Andrusiak, 2014) explores the general trends in the development of national and cross-border recreational and tourism clusters as effective instruments for interregional and international cooperation. A cluster analysis of tourist flows by cross-section of regions of Ukraine was carried out in the work of D. Ocheretin (Ocheretin, 2015), the task of which is to find similar groups of objects in the sample and to identify the location of each region in the tourist flow. O. Chernega, G. Gorina, O. Romanukha, G. Bohatyr'yova, K. Nikolenko (Chernega, Gorina, Romanukha, Bohatyr'yova, Nikolenko, 2019) zoned the territory of Ukraine for the development of cultural and educational tourism, which is based on the calculation of average data on the number of museums by region, analysis of their visits and volume of tourist flows. N. Ivanova (Ivanova, 2017) investigates the socio-economic indicators of the development of the regions of Ukraine in order to identify the homogeneity of objects (regions) of the crisis management system with the help of using cluster analysis methods. A. Okhrimenko (Okhrimenko, 2013) substantiates the urgency and necessity of the development of tourist clusters at the regional level, emphasizes their advantages and importance.

A number of national scientists who use cluster analysis and clustering methods in their studies place emphasis in their works on certain regions of Ukraine. Thus, A. Parfinenko, K. Bosenko (Parfinenko, Bosenko, 2018) explore the potential of tourism clustering of Podilskyi region of Ukraine, V. Hotra (Hotra, 2013) outlines the stages and levels of clustering of the Transcarpathian tourism business in rural development, P. Romaniv (Romaniv, 2017) studies the cluster model of managing tourism activity of Lviv region, and also analyzes the role of cluster entities in the economic development of the regions. O. Mykhailiuk, I. Davidenko (Mykhailiuk, Davidenko, 2018) carry out the analysis of existing and perspective clusters in the tourism sphere of Odessa region, offer directions of tourist activity improvement in the region by taking into account the clustering process.

Cluster analysis and clustering methods are widely used by foreign scientists in studying tourism at all economic levels of its implementation. J. Chávez, A.I. Zamora Torres, M. C. Torres (Chávez, Zamora Torres, Torres, 2016) mainly focus on the analysis of 14 competitiveness tourism factors for 20 country members of the Asia-Pacific Economic Cooperation (APEC) forum. The authors analyze secondary data from the Travel and Tourism Competitiveness Index to create clusters, and then multidimensional scaling techniques were employed for detecting the more or less effective determinants of destination competitiveness. T. Yałçınska, T. Güzel (Yałçınska, Güzel, 2019) focuses on general overview of tourism clusters. Authors propose the explanation what a tourism cluster is, how it is processed, how its network system functions and how tourism clusters are classified. G. Koříková, E. Liptáková, L. Širba, B. Kršák, C. Sidor, M. Cehlár, S. Khouri, M. Behún...
(Koľveková, Liptáková, Šírba, Kršák, Sidor, Cehlář, Khouri, Behün, 2019) discuss the fusion of 54 regions of Central and Eastern Europe (Czech Republic, Slovakia, Hungary, Poland, Estonia, Lithuania, Latvia, Slovenia, Romania, and Bulgaria) into clusters according to the selected accommodation tourism indicators used by the European Statistical Agency (Eurostat) to evaluate tourism. The cluster analysis resulted in the definition of six clusters consisting of regions with similar indicators’ statistics characteristics. D. Lascu, L. Manrai, A. Manrai, A. Gan (Lascu, Manrai, Manrai, Gan, 2018) identify traits of the most attractive tourism destinations in Spain using a two-step cluster analysis to ascertain the relative importance of natural, cultural, and dual attractions to target consumers. A. Ramiresa, F. Brandaob, A.C. Sousa (Ramiresa, Brandaob, Sousa, 2018) segments international tourists visiting the World Heritage City of Porto based on their travel motivations relating to specific destination attributes, as well as gauging their satisfaction with the tourist experience. N. Iswandhani, M. Muhaji (Iswandhani, Muhaji, 2018) used K-means cluster analysis of tourist destination in special region of Yogyakarta using spatial approach and social network analysis.

The result of this research is the determination of the top-10 most popular destinations in Yogyakarta, map of html-based tourist destination distribution consisting of 121 tourist destination points and forms 3 clusters. J. Dew (Dew, 2018) examined different segments of visitors to Tanzania with respect to their values around sustainability through a combination of non-hierarchical and hierarchical cluster analyses. A follow-up analysis using ANOVA and Chi-square indicates that three clusters are significantly different in their sustainable values, their travel motives, and their demographics. J. Rodriguez, I. Semanjski, S. Gautama, N. Van de Weghe, D. Ochoa (Rodriguez, Semanjski, Gautama, Van de Weghe, Ochoa, 2018) developed and implemented a hierarchical clustering approach for smartphone geo-localized data to detect meaningful tourism related market segments. The application of the proposed approach in the Province of Zeeland in the Netherlands allowed to distinguish two major clusters and four sub-clusters which we were able to interpret based on their spatial-temporal patterns and the recurrence of their visiting to the region.

Content analysis of modern domestic and foreign researches devoted to diagnostics of tourist activity allowed to confirm the hypothesis about widespread use of methods of multidimensional statistical analysis, in particular cluster. Researchers subjected to clustering as individual tourist enterprises or organizations and regional tourist markets of whether the same state and tourist regions.

At the same time, it is established that in Ukraine the process of implementation of the cluster model of organization of tourist activity is in the stage of formation. Clusters combine mainly tourism entities, while the regional aspect both of the diagnostics of tourism markets and establishment of the joint strategies and the models of regional travel market development with similar historically formed basic and innovation determinants is ignored.

The aim is to carry out cluster analysis of the regional tourism market indicators for the functioning of tourism, which should improve diagnostic approaches to market and create a basis for study strategies and development models.

**Material and research methods.** The theoretical basis of the study were the provisions of the theory of tourism and tourismology (spatial model of the tourism travels (displacement), structural models of tourism, spatial models of tourism development), economic geography, regional economy, economic theory, macro and micro economics, works of leading domestic and foreign scientists on the tourism development issues.

To achieve this purpose, the following research methods were used in the work: generalization, systematization (for content analysis of the works of domestic and foreign scientists, devoted to the use of cluster analysis and clustering methods in tourism industry studies); analysis and synthesis (to determine the features that clustered the sample objects (regional tourist services markets)); method of cluster analysis based on the integration of objects (regional tourist services markets) into clusters, using a measure of similarity or the distance between them using the STATISTICA 10 software (StatSoft, USA, 2014) (for grouping regional markets of tourist services of Ukraine by indicators of functioning of subjects of tourist activity); graphical and tabular methods (for visualization and ability to see statistical material); cartographic method (to illustrate clusters of regional tourist services markets of Ukraine).

The reliability of the obtained results is ensured by the use of official data of the State Statistics Service of Ukraine. However, it should be noted that the composition and number of clusters depends on the selected partition criteria. In our case, the characteristics by which the grouping (the breakdown criteria) are the indicators selected by the authors from the data of the statistical collection of the State Statistics Service of Ukraine “Tourism in Ukraine in 2018” and which, according to the authors, most reflect the func-
tioning of the subjects of tourism activity. However, the absence/presence of certain features of clusters in a given set can change their structure. Also, the composition and number of clusters will change significantly, taking into account the data of the temporarily occupied territory of the Autonomous Republic of Crimea, Sevastopol and part of the temporarily occupied territories in Donetsk and Luhansk regions.

Results and their analysis. Taking into account the regional specificity of the tourism development should not be based only on the administrative-territorial division of the country. Regional markets for tourism services in Ukraine with similar trends in tourism development may not be related by territorial or administrative feature. It is proposed to carry out the identification of groups of regions with similar tendencies of development of tourist entities and further development of the most relevant and popular development strategies and models by cluster analysis.

24 regions of Ukraine and the city of Kyiv serve as the sampling objects, which features were used for clustering made in 2018 are: the number subjects of tourist activity, the number of staff members of tourist activities, income from tourism, the number of tourists served by tour operators and travel agents, the cost of travel packages sold in different regions.

Initial statistics for cluster analysis of the regional tourism market is presented in the Table 1.

Previous valuation of output data to eliminate differences in performance units made by the formula:

$$Z = \frac{(x-\mu)}{\sigma},$$

where $Z$ – the value of the standard normalized distribution,

$x$ – the value of the output distribution,

$\mu$ – the average value of the original distribution,

$\sigma$ – standard deviation of the original distribution.

Dendogram hierarchical clustering regional travel market was built on the software STATISTICA 10 (StatSoft, USA, 2014) by consecutive Clustering of the nearest first, and then of more and more distant from each other objects. The Euclidian distance was selected as the clustering algorithm. Euclidean distance matrix for the analyzed object (regional tourism market) given in the table 2.

To determine the number of clusters enlarged it is advisable to choose a threshold distance of 1 or higher, while for more detailed fundamental analysis of the tourism services market it is needed to develop the local development strategies advisable to choose a threshold distance of 0.5 and lower, will determine the optimal composition of cluster indicators of activity of the regional tourism market. The built dendogram is shown in the Fig. 1.

Table 1. Initial statistics for cluster analysis of the regional tourism market of Ukraine, 2018 (compiled by the author using (Statistical yearbook “Tourist activity in Ukraine”, 2018))

| Region          | Number of subjects of tourist activity (units) | Number of staff members of tourist activities (persons) | Income from tourism (ths. UAN) | Number of tourists served by tour operators and travel agents (persons) | The cost of travel packages sold (ths. UAN) |
|----------------|-----------------------------------------------|--------------------------------------------------------|-------------------------------|------------------------------------------------------------------------|-------------------------------------------|
| Vinnytska      | 87                                            | 202                                                     | 44367.8                       | 42178                                                                  | 50789.1                                  |
| Volynska       | 74                                            | 100                                                     | 23620.1                       | 21807                                                                  | 41564.8                                  |
| Dnipropetrovka | 416                                           | 748                                                     | 99660.1                       | 116981                                                                 | 550359.9                                 |
| Donetsk        | 93                                            | 164                                                     | 45414.5                       | 28475                                                                  | 139199.5                                 |
| Zhytomyrska    | 63                                            | 67                                                      | 10550.6                       | 17957                                                                  | 94454.6                                  |
| Zakarpatska    | 91                                            | 125                                                     | 29122.4                       | 25348                                                                  | 101795.9                                 |
| Zaporizka      | 188                                           | 309                                                     | 45976.2                       | 56374                                                                  | 396231.8                                 |
| Ivano-Frankivska | 128                                      | 554                                                     | 453399.9                      | 55781                                                                  | 61754                                    |
| Kyivska        | 217                                           | 339                                                     | 58981.2                       | 66385                                                                  | 289505.1                                 |
| Kirovohradska  | 54                                            | 58                                                      | 16571.6                       | 11556                                                                  | 39793                                    |
| Luhanska       | 29                                            | 39                                                      | 7461                          | 6261                                                                   | 5286.5                                   |
| Lvivska        | 342                                           | 811                                                     | 511590.4                      | 182255                                                                 | 386274.4                                 |
| Mykolaisvka    | 87                                            | 72                                                      | 16583.5                       | 19002                                                                  | 93039.6                                  |
| Odeska         | 270                                           | 741                                                     | 202190.7                      | 81381                                                                  | 532000.4                                 |
| Poltavska      | 155                                           | 217                                                     | 25604.5                       | 32007                                                                  | 70424.8                                  |
| Rivnenska      | 93                                            | 135                                                     | 19992.3                       | 22027                                                                  | 77158                                    |
| Sumsksa        | 79                                            | 74                                                      | 15788.2                       | 16178                                                                  | 46447.6                                  |
| Ternopilska    | 63                                            | 104                                                     | 12345.8                       | 13103                                                                  | 37343.4                                  |
| Kharkivska     | 266                                           | 443                                                     | 86603.2                       | 62232                                                                  | 344204.2                                 |
| Khersonska     | 80                                            | 136                                                     | 53914                         | 26130                                                                  | 34531.1                                  |
| Khmelnytska    | 89                                            | 120                                                     | 12610.6                       | 25738                                                                  | 38228                                    |
| CherkasKa      | 191                                           | 167                                                     | 22722.1                       | 26383                                                                  | 42603.4                                  |
| Chernivetska   | 77                                            | 194                                                     | 28990.1                       | 29562                                                                  | 128982.4                                 |
| Chernihivska   | 58                                            | 97                                                      | 12074.5                       | 22306                                                                  | 66293.7                                  |
| Kyiv           | 1093                                          | 5861                                                    | 19769786                      | 3550090                                                                 | 13398039.7                               |
At a threshold of 0.5, 6 clusters are formed in the tourist services market of Ukraine. **Cluster 1** is Kyiv, which according to all indicators of the functioning of the subjects of tourist activity (number of subjects of tourist activity; number of stuff members of tourist activity; income from tourism; number of tourists served by tour operators and travel agents; the cost of travel package sold) is in the first place. **Cluster**
2 is formed by Zaporizhzhya, Kyiv, Poltava, Ivano-Frankivsk regions. Cluster 3 and Cluster 4 consist of two sample objects - Dnipropetrovsk, Lviv and Odesa, Kharkiv regions respectively. Cluster 5 unites the Zhytomyr, Ternopil, Cherniviv, Kirovograd and Luhansk regions. Cluster 6 is the most numerous, grouping eleven regions of Ukraine, namely Vinnytsia, Chernivtsi, Donetsk, Cherkasy, Transcarpathian, Rivne, Khmelnytsky, Volyn, Sumy, Kherson and Mykolaiv regions (table 3).

Accounting constraints of the development of the regional tourist market of Ukraine (regional cluster of tourist market) in terms of spatial polarization is advisable by dividing them into internal and external. Internal constraints delineate the boundary of individual travel market in the region (regions, clusters) caused by the imperfection or absence of endogenous determinant of the market, which in turn is advisable to distinguish between the historically-formed base and innovative determinants (Horina, 2016).

| Cluster | Cluster integration level | Cluster | Cluster integration level | Cluster | Cluster integration level |
|---------|--------------------------|---------|--------------------------|---------|--------------------------|
| 1       | 0.4865010                | Cluster 1 | 0.4865010               | Zaporizka, Kyivska, Poltavska, Ivano-Frankivska |
| 2       | 0.2732135                | Cluster 3 | 0.2139298               | Zhytomyrska, Ternopilska, Chernivivska, Kirovohradska, Luhanska |
| 3       | 0.3802633                | Cluster 4 | 0.8406595               | Dnipropetrovskivska, Lvivska, Odeska, Kharkivska |
| 4       |                          |          |                          |                        |
| 5       |                          |          |                          |                        |
| 6       |                          |          |                          |                        |

Historically-formed determinants are revealed through the “… assessment of the imperfection localization or lack of necessary natural resource and socio-demographic factors for the development of the tourist service market, namely favorable geographical location and natural and climatic conditions, access to natural resources, optimal proximity to external borders / center, the availability of a sufficient number of skilled labor resources, the level of labor productivity caused by socio-cultural characteristics and ethnic composition of the population” (Gorina, 2016). Among the historically-formed determinants that influenced the formation of tourist services regional market clusters of Ukraine, natural resource determinants prevail, namely: provision and access to natural resources, favorable natural and climatic conditions, proximity to external borders.

Innovative determinants are revealed due to set of restraining restrictions that arise as a result of im-
perfection of institutional and infrastructural support for the formation of the tourist market (transport and sectoral infrastructure, organizational and institutional structures), heterogeneity and structural unevenness of the industrial and economic complexes, which ensures the low level of tourism, imperfect sectorial and regional development strategies. Among the innovative determinants that traditionally influence the formation of inequality in the development of tourist regions of the tourism service national market are the most influential: institutional and infrastructural determinants (transport and sectoral infrastructure), determinants of innovation (innovational and investment activity in the tourism industry), political and economic determinants (regional policy in the field of tourism; the presence of a tourism and recreational component in the development strategy of the region), integration determinants (degree of the region involvement in foreign economic activity; participation in relevant integration associations, cross-border cooperation in the field of tourism), globalization determinants (presence and position of large corporate structures in the region, namely the presence of international hotel nets, international tour operators, etc.; involvement in the international specialization and cooperation in the tourism industry; involvement in international trade, international investment processes, interregional competition).

External constraints are hindering integration, globalization and the development of the tourism market and are manifested in the absence of exogenous determinants of development. These restrictions mainly concern the national tourism market as a whole.

Analyzing the spatial distribution of clusters of regional tourist service markets of Ukraine, shown in the Figure 2, we can conclude about the prevailing lack of geographical proximity of the formed clusters. Only the cluster 6 is the exception as it combines more than 40% of the sample sites (eleven regions of Ukraine, namely Vinnytsia, Zaporizhia, Donetsk, Cherkasy, Transcarpathian, Rivne, Khmelnytsky, Lutsk, Sumy, Kherson and Mykolaiv regions), with common geographical boundaries in a limited space.

Cluster 1, which was established in Kyiv, is a center for tourism development, on the basis of which the main volume of tourist demand is formed, tourist infrastructure is concentrated, tourist flows are concentrated, major innovations in the Tourism sector are generated, and as a result of the spatial diffusion process, they are spread to other clusters / regional tourist service markets.

Further calculation of the cluster market shares in the tourist service market of Ukraine will allow to determine what place the cluster occupies in the relevant segment in relation to its competitors (other

Fig. 2. Spatial distribution of regional clusters of tourism market of Ukraine (distance threshold - 0.5)
clusters), to predict the further prospects of their development, to evaluate the effectiveness of cluster activities, etc.

The calculated market shares of 6 clusters, which were determined at a threshold distance of 0.5 (table 3) are given in the table 4. The objects of the cluster sample correspond to the column 3 of the table 3.

In terms of indicators by which the clusters were grouped and evaluated, we have the following results:

by market share of the cluster by the number of subjects of tourist activity, the largest market share belongs to the cluster 1 (25.46%), the smallest – to the cluster 5 (6.22%);

by market share of the cluster by the number of staff members of tourist activities, the largest market share belongs to the cluster 1 (49.35%), the smallest – to the cluster 5 (3.07%);

by market share of the cluster by income from tourism, the largest market share belongs to the cluster 1 (91.42%), the smallest – to the cluster 5 (0.27%);

by market share of the cluster by the number of tourists served by tour operators and travel agents, the largest market share belongs to the cluster 1 (77.90%), the smallest – to the cluster 5 (1.56%);

by market share of the cluster by the cost of travel packages sold, the largest market share belongs to the cluster 1 (78.51%), the smallest – cluster 5 (1.42%).

These data allow us to state that the largest market shares by all indicators belong to the cluster 1 (Kyiv), the smallest – to the cluster 5 (Zhytomyr, Ternopil, Chernihiv, Kirovograd, Luhansk regions).

Conclusions. It is determined that the disproportion of the distribution a redistribution of natural a recreational a socio-economic resource and the influence of historically formed and innovative determinants leads to uneven development of the tourist space. In this regard, it is concluded that the regional differentiation of the development of tourist services markets in Ukraine is caused by factors of formation of spatial polarization, which affect the spatial structure of the tourism system, cause and enhance its asymmetry and lead to the need to take into account the identified processes in the development of concepts and strategies of development markets.

The cluster analysis of regional tourist service markets according to the indicators of functioning of tourist entities (the number of subjects of tourist activity; the number of stuff members of tourist activities; income from tourism; the number of tourists served by tour operator an travel agents; the cost of travel packages sold) allowed to distinguish 6 clusters at a threshold distance of 0.5, namely: cluster 1 – Kyiv, cluster 2 – Zaporizhia, Kyiv, Poltava, Ivano-Frankivsk region, cluster 3 – Dnipropetrovsk, Lviv regions, cluster 4 – Odessa, Kharkiv regions, cluster 5 is formed from Zhytomyr, Ternopil, Chernihiv, Kirovograd and Luhansk regions, cluster 6 unites Vinnytsia, Chernivtsi, Donetsk, Cherkasy, Transcarpathian, Rivne, Khmelnytsky, Volyn, Sumy, Kherson and Mykolaiv regions. The clustering carried out can serve as the basis for the further evolution of strategies and models for the development of certain clusters.

Study of tendencies for the development of each cluster, determination of market share of clusters in the market of tourist services of Ukraine, in-depth and detailed analysis taking into account factors of formation of spatial polarization using the methods of multidimensional statistical analysis and other analytical methods may be the topic of further researches.

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