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**STRUCTURAL ANALYSIS OF THE INTERACTIONS BETWEEN
THE FACTORS OF DEVELOPMENT OF TOURISM
IN THE PODLASKIE PROVINCE**

Key words

Structural analysis, direct impact, factors of tourism development, Podlaskie Province.

Abstract

The article presents the results of the structural analysis of the interaction of the factors determining the development of tourism in the Podlaskie Province. The basis for the study were the results of the STEEPVL analysis carried out with the participation of travel industry experts representing the realm of science, business, administration, non-governmental organizations, cultural institutions, protected areas, and the media. As a result of the STEEPVL analysis, the experts selected 21 main factors, 3 in each of the groups of factors: social, technological, economic, ecological, political, values, and legal. In the next stage of the study, the experts assessed the factors regarding the strength of their mutual influence and then a statistical analysis was performed. As a result of the audit, 3 key factors were identified aspiring to become the driving forces of tourism development scenarios in the Podlaskie Province.

Introduction

The development of tourism in the regions is heavily dependent on the phenomena occurring both within the regions, as well as outside their borders. The constantly changing and uncertain environment requires building competitive and developmental strategies of shaping tourism in the next several years. The implementation of new forms of the anticipation of future developments and the application of knowledge about the prospective market segments, using the methods used in the study of foresight, can streamline the strategic management of tourism in the regions.

The choice of the research area was dictated by the weaknesses of the tourism management process in Polish provinces, identified in the earlier research conducted by the author. They are reflected mainly in the repeatability of the test methodology used to formulate a strategy in which each region is treated the same, despite the many differences in the economic, social, technological, environmental, and political spheres. Another weak side is also the low level of the participation of experts and stakeholders in creating strategic documents, causing the stakeholders to not identify with the developed objectives and directions of development, through which they do not feel co-responsible for their implementation [4].

The purpose of this article is to identify the level of interaction between the factors determining the development of tourism in the Podlaskie Province. The achievement of the objective was made possible thanks to the design of the test scheme consisting of a 3 phased sequence of consecutive methods used in the study of foresight. One of the used test methods was structural analysis, which is the subject of this article. The study was attended by experts from the broadly understood tourism industry, representing the sphere of business, administration, science, NGOs, protected areas, cultural institutions, and the media.

1. The assumptions of structural analysis

Structural analysis is a tool enabling the organization and analysis of mutually interacting factors (variables). By detecting relationships between seemingly unrelated variables, it allows one to determine the relationship between them, and on this basis, to identify the key factors in the system under study [1, 8, 10, 13]. The list of variables can be identified, for example, by conducting the STEEPVL analysis. Then the pairs of factors A and B are analysed, for which the direct impact of factor A on factor B and the strength of the effect: small – 1, medium – 2, high – 3 are determined. The lack of effect is marked with as 0 [8, 10, 13]. The matrix of the interactions between factors, for example, may take the form shown in Figure 1.

| Specification | Factor 1 | Factor 2 | Factor ... | Factor N |
|---------------|----------|----------|------------|----------|
| Factor 1 | | | | |
| Factor 2 | | | | |
| Factor ... | | | | |
| Factor N | | | | |

Fig. 1. The matrix for structural analysis
Source: own study based on [8, 10, 13].

The matrix of direct influence allows one to perform calculations for the identification of direct and indirect relationships between the factors influencing the research area. Calculations can be performed with the use of the MIC-MAC application (Impact Matrix Cross – Reference Multiplication Applied to a Classification), which is based on the Boolean algebra logic principle [2, 8, 10]. The use of the MICMAC application enables testing and comparing the hierarchy of individual variables in terms of their direct and indirect influence. The study provides a lot of information about the system that is the subject of analyses [8, 10, 13]. The MICMAC application determines the strength of the direct and indirect interactions between the factors, based on a predefined matrix of direct influences [5]. The use of the software allows for the grouping of variables and identifying those with the greatest impact on the whole system [2, 11].

Structural analysis is carried out in three steps [1, 8, 10]:

- Drawing up a list of variables affecting a given research area (it is the most time consuming and most important stage of the study);
- A description of the interrelationships between the variables; and,
- The identification of key variables.
- The structural analysis, performed with the use of the MICMAC application allows distinguishing the following groups from all the factors affecting a given area of research:
 - Key factors – characterized by a large force of impact and a high degree of dependence on other factors, and due to high volatility, they require special attention and research;
 - Objective factors – more dependent on other factors and changing under their influence than affecting other factors, and they represent the possible objectives of the examined system;
 - Result factors – characterized by a low impact, and high dependency on other factors, which are particularly susceptible to changes of key factors;
 - Determinant factors (engines and brakes) – factors that have a very strong impact on the system, and at the same time are characterized by low dependency on other factors, and they may be either driving or braking in nature, which are difficult to control;

- Regulatory and auxiliary factors – have little impact on the system, but can be helpful in achieving the strategic objectives;
- External factors – characterized by a less significant impact on the system than the impact of determinants, but greater than the impact of autonomous variables, and factors in this group are not subject to the influence of other variables; and,
- Autonomous factors – exhibiting the least impact on the changes taking place in the system as a whole [3, 6, 8, 9, 10, 12, 13].

The advantage of the structural analysis is its ability to identify the dependencies connecting the variables, the mutual influences of which are not obvious and may remain unrecognized. The weakness of the analysis is, in turn, the occasional artificial limitation of the variables considered in such a way as to allow the experts to determine their interrelationships within a reasonable amount of time [8].

2. Methodology of the study

Within the framework of the study, structural analysis was carried out in three stages:

- Drawing up a list of factors that influence the development of tourism in the Podlaskie Province, and in order to identify factors, the STEEPVL analysis was used;
- A description of the interrelationships between the variables, which allow the reconstruction of the system and presentation of the network of relationships between variables; and,
- The identification of key variables with the use of the MIC-MAC application [3, 9].

The basis for the study were the results of the STEEPVL analysis carried out in the first stage of the research process with the participation of 56 experts from the tourism industry, representing the realm of science, business, administration, non-governmental organizations, and cultural institutions, as well as the media and the protected areas (Fig. 2). Through the use of the STEEPVL analysis, experts selected 21 main factors that significantly affect the development of tourism, 3 in each of the groups of factors, which were social, technological, economic, ecological, political, legal, and values.

In the second stage of the study, factors were assessed by experts, regarding the strength of their mutual influence. The strength of the influence of the factors was assessed by a group of 46 experts with the use of the following criteria, where 0 – no impact, 1 – weak impact, 2 – medium impact, and 3 – significant impact. Completion of the electronic version of the matrix of direct impacts by each of the experts, with the use of the CAWI technique, enabled

the identification of the relationship between the factors influencing a given research area.

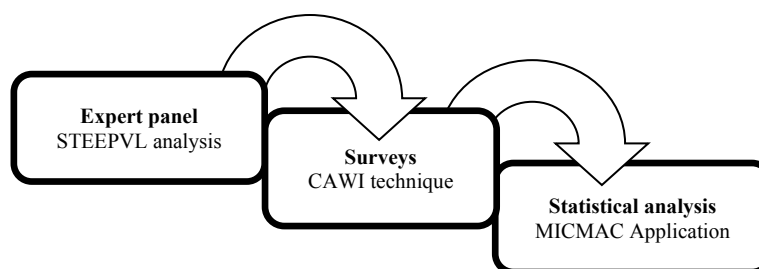


Fig. 2. The stages of the research process
Source: The author.

In the third stage, based on the collective results of the forms of the matrix of direct impacts, statistical analyses were carried out, which enabled the construction of the resulting matrix of direct impacts. The analyses were performed using the MICMAC application (Fig. 3).

3. The results of the structural analysis

The structural analysis covered a set of 21 factors of the development of tourism in the Podlaskie Province, which was generated as a result of the work of the expert panel using the STEEPVL analysis. The list of factors underlying the structural analysis is presented in Table 1.

Table 1. The main factors affecting the development of tourism in the Podlaskie Province

| Acronym | Group of factors |
|----------------------------------|--|
| Social factors (S) | |
| S1 | Level of affluence of the society |
| S2 | Level of qualifications and professional competence of the society of the region (including in the field of tourism) |
| S3 | Entrepreneurial behaviour of the local society |
| Technological factors (T) | |
| T1 | Level of development of tourism infrastructure in the region |
| T2 | Transport accessibility of the region (roads, railways) |
| T3 | Ability to create innovative tourism products and services in the region |
| Economic factors (Ekon) | |
| Ekon1 | Expenditures of the region on its promotion |
| Ekon2 | Economic activity of the local community |
| Ekon3 | Level of quality and the prices of goods and tourism services in the region |
| Ecological factors (Ekol) | |
| Ekol1 | State, quality of the environment and its individual components in the region |
| Ekol2 | Natural resources of the region (valuable, protected natural areas) |
| Ekol3 | Rank/uniqueness of the natural values of the region |

| Acronym | Group of factors |
|------------------------------|---|
| Political factors (P) | |
| P1 | Efficiency and effectiveness of local and regional authorities |
| P2 | Regional tourism policy |
| P3 | The border location of the region |
| Value factors (V) | |
| V1 | Conservation status of the tangible and intangible heritage of the region (monuments, traditions, folklore) |
| V2 | Promoting culture, regional cuisine, folk crafts |
| V3 | Openness, hospitality of the inhabitants of the region |
| Legal factors (L) | |
| L1 | Clarity and transparency of legislation |
| L2 | Spatial development plans of the region |
| L3 | Visa regulations and customs (visa-free travel and simplification of customs clearance) |

Source: The author.

In the next step, the resulting matrix of direct impacts was prepared based on the direct impacts matrix forms, supplemented by each of the 46 experts, using the CAWI technique. The matrix size was 21×21. The experts participating in the study determined 441 interdependencies between the factors (variables). In 162 cases, the dominant value was zero, meaning no relationship between the variables. In 67 cases, a weak dependence was found, and in 157 cases, a moderate dependence was found. Strong relationships between variables were identified in 55 cases. Values different from zero were entered in 63% of the fields, and the values equal to zero were recorded in 37% of the fields (Tab. 2).

Table 2. Characteristics of the matrix of direct impacts

| Indicator | Value |
|--------------------------------------|-------|
| Dimensions the matrix | 21 |
| The number of zeros (no impact) | 162 |
| The number of ones (weak impact) | 67 |
| The number of twos (moderate impact) | 157 |
| The number of threes (high impact) | 55 |
| Degree of completion | 63% |

Source: The author.

The values appearing in the resulting matrix were obtained based on the dominant values of expert assessments of the force of impact of individual factors on other factors. The degree of the interactions between the various factors of the development of tourism in the Podlaskie Province, defined in this way, is presented in Table 3.

Table 3. The degree of influence between 21 factors of tourism development in the Podlaskie Province

| Acronym | S1 | S2 | S3 | T1 | T2 | T3 | Ekon1 | Ekon2 | Ekon3 | Ekol1 | Ekol2 | Ekol3 | P1 | P2 | P3 | V1 | V2 | V3 | L1 | L2 | L3 |
|---------|----|----|----|----|----|----|-------|-------|-------|-------|-------|-------|----|----|----|----|----|----|----|----|----|
| S1 | 0 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 0 | 0 | 1 | 1 | 0 | 2 | 1 | 2 | 0 | 0 | 0 |
| S2 | 2 | 0 | 3 | 2 | 1 | 3 | 2 | 3 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 2 | 3 | 1 | 1 | 2 | 0 |
| S3 | 3 | 3 | 0 | 3 | 1 | 3 | 2 | 3 | 3 | 1 | 1 | 0 | 2 | 2 | 0 | 2 | 2 | 1 | 0 | 2 | 1 |
| T1 | 3 | 2 | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 0 | 2 | 0 | 2 | 2 | 0 | 0 | 2 | 0 |
| T2 | 2 | 1 | 2 | 3 | 0 | 2 | 1 | 2 | 2 | 1 | 1 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | 2 | 0 |
| T3 | 3 | 3 | 3 | 3 | 2 | 0 | 2 | 2 | 3 | 1 | 1 | 0 | 1 | 2 | 0 | 2 | 3 | 1 | 0 | 1 | 0 |
| Ekon1 | 2 | 0 | 2 | 2 | 1 | 2 | 0 | 2 | 2 | 1 | 1 | 0 | 1 | 2 | 0 | 2 | 3 | 0 | 0 | 0 | 0 |
| Ekon2 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 0 | 2 | 1 | 0 | 0 | 1 | 2 | 0 | 2 | 2 | 1 | 0 | 1 | 0 |
| Ekon3 | 2 | 0 | 2 | 2 | 0 | 2 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 1 | 0 | 0 | 0 |
| Ekol1 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 0 | 3 | 3 | 0 | 2 | 0 | 2 | 2 | 0 | 0 | 2 | 0 |
| Ekol2 | 1 | 0 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 0 | 3 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 2 | 0 |
| Ekol3 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 2 | 0 |
| P1 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 0 | 0 | 3 | 0 | 3 | 3 | 0 | 3 | 3 | 2 |
| P2 | 1 | 1 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 0 | 0 | 2 | 2 | 1 | 3 | 2 | 1 |
| P3 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 3 |
| V1 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 2 | 0 |
| V2 | 1 | 0 | 2 | 2 | 0 | 1 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 | 0 |
| V3 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| L1 | 1 | 0 | 3 | 2 | 0 | 2 | 0 | 3 | 1 | 2 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| L2 | 0 | 0 | 2 | 2 | 2 | 0 | 0 | 1 | 0 | 2 | 2 | 1 | 2 | 3 | 0 | 2 | 0 | 0 | 3 | 0 | 0 |
| L3 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | 3 | 0 | 0 |

Source: The author.

The results indicate that the greatest direct impacts on other factors were exerted by the following group of political factors: P1 (the efficiency and effectiveness of local and regional authorities) and P2 (regional tourism policy). Among the social factors, the greatest direct impacts on other factors were the following: S3 (entrepreneurial behaviours of the local society) and S2 (the level of professional qualifications and competences of the local society including those in the field of tourism). Among technological factors, the greatest direct impacts were exerted by the following: T3 (the capacity to create innovative tourism products and services in the region) and T1 (the level of development of tourist infrastructure in the region), (Tab. 4).

Table 4. The aggregate strength of direct the interactions occurring between the factors of the structural analysis

| Acronym | The total force of impact | The total force of dependency |
|--------------|---------------------------|-------------------------------|
| S1 | 29 | 35 |
| S2 | 33 | 18 |
| S3 | 35 | 41 |
| T1 | 30 | 42 |
| T2 | 24 | 25 |
| T3 | 33 | 36 |
| Ekon1 | 23 | 34 |
| Ekon2 | 27 | 40 |
| Ekon3 | 19 | 37 |
| Ekol1 | 26 | 26 |
| Ekol2 | 25 | 17 |
| Ekol3 | 27 | 10 |
| P1 | 40 | 19 |
| P2 | 38 | 39 |
| P3 | 26 | 5 |
| V1 | 23 | 31 |
| V2 | 19 | 33 |
| V3 | 6 | 11 |
| L1 | 24 | 13 |
| L2 | 22 | 25 |
| L3 | 17 | 9 |
| Total | 546 | 546 |

Source: The author with the use of the MICMAC application.

The factors most dependent on the remaining factors are two of the technological factors: T1 (the level of development of the tourist infrastructure in the region) and T3 (the capacity to create innovative tourist products and services in the region). Two of the group of social factors were S3 (entrepreneurial behaviours of the local society) and S1 (the level of the wealth of the society). Three of the group of economic factors were Ekon2 (economic activity of the local community), Ekon3 (the level of quality and price of goods

and tourism services in the region), and Ekon1 (investment of a region in its own promotion), Two of the group of value factors were V2 (promoting culture, regional cuisine, folk crafts) and V1 (the state of preservation of the tangible and intangible heritage of the region (monuments, traditions, folklore)), and there was one political factor, P2 (regional tourism policy), (Tab. 4).

As part of the conducted analyses, using the MICMAC application, a graph was created showing the strongest direct influences of the highlighted factors (Fig. 3). The lines connecting the various factors point to a strong mutual influence of individual factors. For example, the arrow drawn from the T3 factor to Ekon3, S2, and T1 indicates a strong influence exerted by the T3 factor on Ekon3, S2, and T1. In contrast, the arrows drawn from factors S2 and P2 to the T3 factor indicate that the T3 factor strongly depends on the formation of factors S2 and P2.

The analysis of the graph shows that the strongest influence on others is exerted by 3 factors – S1, T3, and P2. Factor S1 (the level of affluence of the society) has a strong impact on S2 (the level of professional qualifications and competencies of the society of the region), T1 (the level of development of tourist infrastructure in the region), and Ekon2 (the economic activity of the local community). At the same time, its formation is strongly dependent on the entrepreneurial behaviour of the local community (S3) and the economic activity of the local community (Ekon2), (Fig. 3).

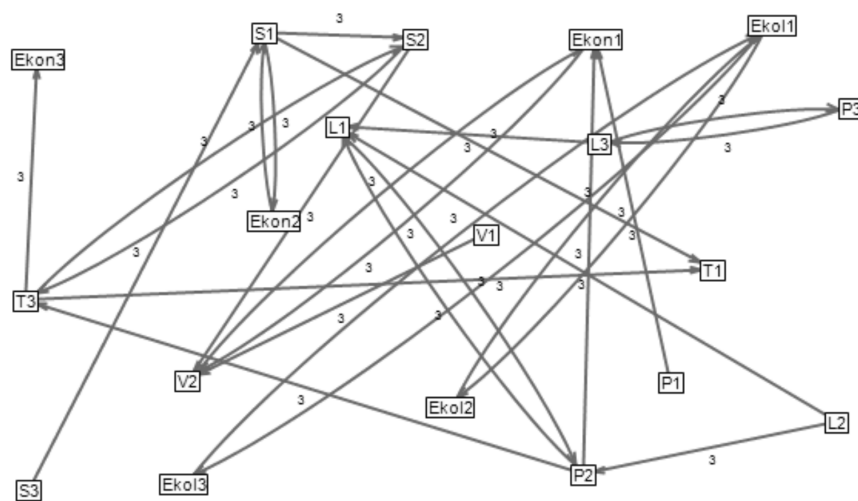


Fig. 3. Graph of strong direct interactions
Source: The author with the use of the MICMAC application.

Another factor strongly influencing the others is T3, which is the capacity to create innovative tourist products and services in the region, which has

a strong influence on the level of development of the tourist infrastructure in the region (T1), professional qualifications and competencies of the society of the region (S2), and the level of quality and the prices of goods and tourist services in the region (Ekon3). Its formation is strongly dependent on the regional tourism policy (P2) and the level of professional qualifications and competencies of the society of the region (S2).

Factor P2 (regional tourism policy) also has a strong influence on the scale of expenditures on promotion (Ekon1) and the clarity and transparency of the legislation (L1), (Fig. 3). Strong interactions were not noted, however, in the case of two factors: T2 (communication accessibility of the region, i.e. roads, railways) and V3 (openness, hospitality of the inhabitants of the region). The article, due to its volume limitations, characterizes only the strong influences of the tested factors. It is, however, possible to conduct more detailed analyses, taking into account also the moderate and weak mutual interactions between the factors.

In the last stage of the conducted analyses, the distribution of factors on the plane of impact-dependence was carried out in accordance with the methodology of structural analysis and with the use of the MICMAC application. The selected seven groups of factors (key, results, objective, determinants, autonomous, external, regulatory, and auxiliary) have been marked with rectangular frames in accordance with the legend set out in Fig. 4.

In the area of key factors, three factors were included: P2 – regional tourism policy, S3 – entrepreneurial behaviours of the local society, and T3 – the capacity to create innovative tourist products and services in the region.

The group of objective factors included three factors: S1 – the level of affluence of the society, Ekon2 – economic activity of the local community, and T1 – the level of development of the tourist infrastructure in the region. The results of the test system also consist of three factors: Ekon3 – the level of quality and price of goods and tourist services in the region, Ekon1 – investment of the region on its promotion, and V2 – the promotion of culture, regional cuisine, and folk craft.

The V3 factor (openness, and the hospitality of the region) is an autonomous factor. The group of external factors may include Ekol2 – the natural resources of the region (valuable natural areas, protected areas), Ekol3 – rank/uniqueness of the natural assets of the region, L1 – clarity and transparency of legislation, and P3 – border location of the region. The impact of these factors on the system is greater than the impact of autonomous factors, and simultaneously the impact of the system on these factors is insignificant.

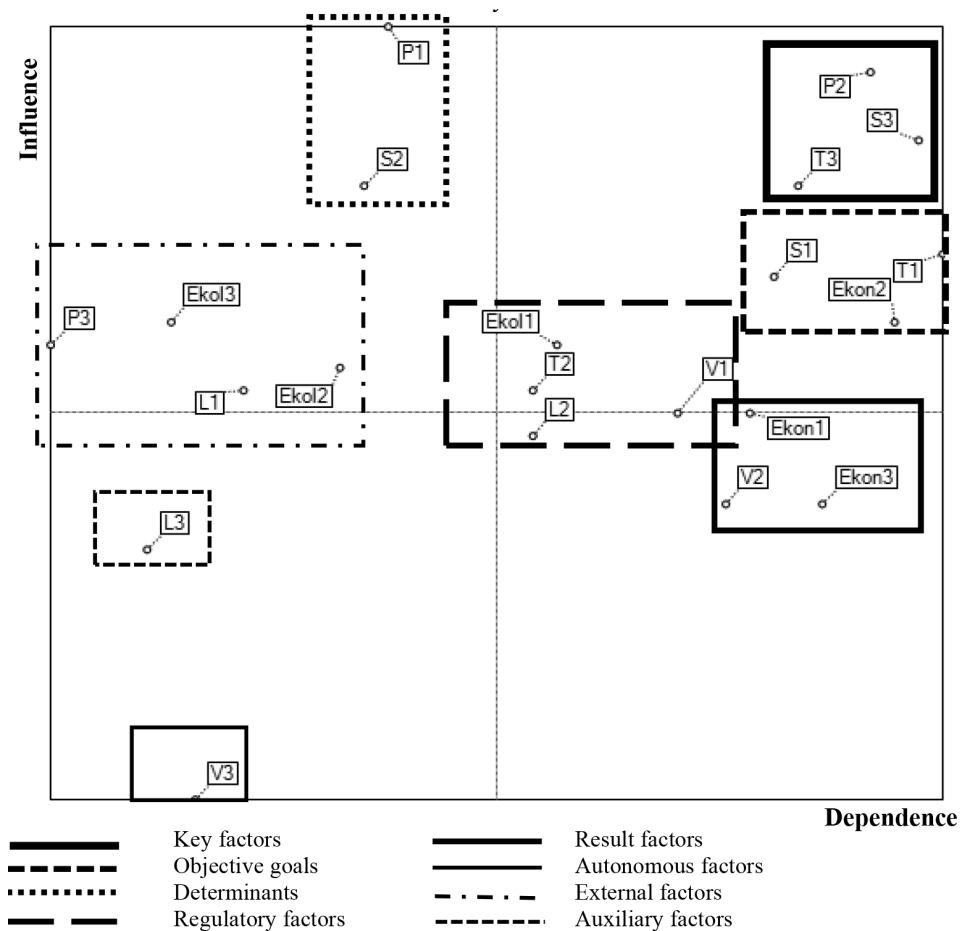


Fig. 4. Distribution of factors of structural analysis based on direct interactions
Source: The author with the use of the MICMAC application.

Factor L3 – customs and visa regulations (visa-free travel and simplification of customs clearance) is an auxiliary factor. The group of regulatory factors includes four factors: Ekol1 – the condition and the quality of the environment and its individual components in the region, T2 – communication accessibility of the region (roads, railways), L2 – regional spatial development plans, and V1 – the state of preservation of the tangible and intangible heritage of the region (monuments, traditions, folklore). In contrast, the determinants of the examined system consist of the following factors: P1 – the efficiency and effectiveness of local and regional authorities, and S2 – the level of professional qualifications and competencies of the society of the region (including in terms of tourism), (Fig. 4).

Conclusions

The results of the structural analysis presented in this paper include the manner in which the group of experts perceive the examined system, which is the process of the development of tourism in the Podlaskie Province. The conducted structural analysis, which was based on the resulting matrix of direct impacts, made it possible to isolate the key factors that have a strong influence on other factors and are also highly dependent on other factors. As part of the undertaken research process, three key factors were identified: P2 – regional tourism policy, S3 – entrepreneurial behaviours of the local society, and T3 – the capacity to create innovative tourist products and services in the region. At the same time, as a result of the STEEPVL analysis, the indicated key factors were also recognized as the factors characterised by the highest level of importance and uncertainty.

Factors – P2, S3 and T3, due to their high impact and high degree of dependence on other factors, as well as the high level of importance and uncertainty regarding their development in the longer term, contest for the status of the driving forces (driving forces) of the scenarios for the development of tourism in the Podlaskie Province. However, from among the three indicated factors, only 2 ultimately can create the structure of scenarios. Their final selection will be made in the subsequent planned stages of the research process, as a result of discussions and a vote carried out among experts.

The results presented in this paper are the basis for the conclusion that the structural analysis is a method that can be successfully integrated into the process of formulating the strategies of tourism development in the region. This is because it allows the identification of the forces of interdependence of individual factors influencing the development of tourism in the region, previously neglected in the formulation of strategic documents, and important for the formulation of the vision of the future of a given research area.¹

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Analiza strukturalna wzajemnego oddziaływania czynników rozwoju turystyki w województwie podlaskim

Słowa kluczowe

Analiza strukturalna, oddziaływania bezpośrednie i pośrednie, czynniki rozwoju turystyki, województwo podlaskie.

Streszczenie

W artykule zaprezentowano wyniki analizy strukturalnej wzajemnego oddziaływania czynników determinujących rozwój turystyki w województwie podlaskim. Podstawę do przeprowadzenia badania stanowiły wyniki analizy STEEPVL przeprowadzonej z udziałem ekspertów z branży turystycznej reprezentujących sferę nauki, biznesu, administracji, organizacji pozarządowych oraz instytucji kultury, obszarów chronionych i mediów. W ramach analizy STEEPVL eksperci wyłonili 21 czynników głównych, po 3 w każdej z grup czynników: społecznych, technologicznych, ekonomicznych, ekologicznych, politycznych, wartości i prawnych. W kolejnym etapie badania czynniki zostały poddane ocenie eksperckiej siły ich wzajemnego oddziaływania, a następnie analizie statystycznej. W rezultacie przeprowadzonego badania wyłoniono 3 czynniki kluczowe pretendujące do miana sił napędowych scenariuszy rozwoju turystyki w województwie podlaskim.