AHP BASED MULTICRITERIA COMPARATIVE ANALYSIS OF REGIONS OF EASTERN POLAND

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ABSTRACT

The modern economic landscape dynamically creates new and often difficult conditions in which all types of organizations must function. In management sciences literature the companies sector is the situation most often analyzed, yet it is also important to improve the management processes in public administration. The global economic crisis that started in 2008 assumed the form of a public finance crisis especially in developed economies. Public authorities are forced to meet the rising expectations of democratic societies while maintaining financial discipline. The pressure to optimize public spending constantly increases. Decision-making processes must therefore focus on the dimensions most relevant to the development of economic systems data. This research takes into account these realities, and focuses on the competitiveness of regions located in so-called Eastern Poland. The study uses a multi-criteria comparative analysis based on the AHP method. The procedure involved building models of competitiveness which systemize statistical variables describing the phenomenon of competitiveness. Based on these models, measurements were constructed and the level of competitiveness was calculated. The regions selected for the case study are separated according to the Polish cohesion policy due to their similar developmental problems. The author is very familiar with the context of development for the selected regions which makes the evaluation of the usefulness of the results obtained by the analysis easier.

Keywords: public administration; regional competitiveness; strategic management; AHP; comparative analysis

1. Introduction

The development of regions and other economic systems (national or local) is perhaps the most common topic of research in economic sciences. Therefore, it is worth analyzing from the perspective of decision-making processes related to the development of these systems. The research carried out is not only for the understanding of the mechanisms of development, but also for supporting actions connected with their stimulation, maintenance, and monitoring. In such a situation, regional analysis should be treated as a

strategic management tool, directed at supporting the decision-making processes. Preparation of management information and its proper interpretation is the key to properly defining the problems and opportunities of development. Hence, the relevance of the formulated strategic objectives depends on the quality of the obtained image of the current situation of the economic system and the directions of changes taking place in it.

The process of strategic management development of territorial units in Poland faces many barriers of various types. One of them is inadequate, poorly structured strategic analysis. In the majority of local and regional strategies in Poland, aggregate measures describing various dimensions of the socioeconomic situation are used in a limited way. The Benchmarking method is also not very popular. Typically therefore, the strategic analysis is carried out without a broader reference to the situation in other territorial units (benchmarks). This significantly limits the scope of the strategic information obtained and creates the risk of an improper definition of the strategic objectives. However, there are tools that make it possible to gain more complete strategic information. One of these tools is a multi-criteria comparative analysis called the Analytical Hierarchy Process (AHP).

The purpose of this article is to describe the use of the AHP method in a multi-criteria comparative analysis using the example of the regions of so-called Eastern Poland. The structure of the accepted research goals is as follows[1]:

- GRQ: How are the competitive positions of regions of Eastern Poland shaped with respect to the other regions of the country?
- DRQ.1: How are the competitive positions of regions measured?
- DRQ.2: What is the competitive position of particular regions of Eastern Poland?
- DRQ.3: How has the competitive position of the particular regions of Eastern Poland changed in the past?

The study was conducted in order to evaluate the competitiveness of the investigated territorial units. First, a brief review of the literature was performed to find a definition of the concept of regional competitiveness and general challenges for strategic management in public administration. References were also researched concerning the strategic management process and procedures for multi-criteria comparative analysis. Then, two models of AHP were created to measure the competitiveness in two dimensions – endogenous potential (SEEGI Model), and attractiveness relative to stakeholders (TCB model). They were used to organize the variables, forming the basis for their selection and construction of aggregate indicators. The local wages of individual elements of the model were obtained on the basis of the judgments of experts dealing with regional development. Finally, the article gives a brief summary and conclusions of the audit.

2. Managing the regional development

Three types of subdivisions of territorial administration can be identified in the Polish system: 16 regions (voivodeships) at the local level, 314 districts (poviats), 66 towns with district rights, and nearly 2.5 thousand municipalities (CSO 2015). The central authorities shape the general conditions for economic development. In Poland and other countries of

[1] GRQ – General Research Question, DRQ – Detailed Research Question.

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the European zone, regions are the main level of management of territorial development. Cohesion policies are created for them and various instruments of financial support are based on them. At the regional level in Poland, the major part of the territorial development policy is based on the support of national and especially European funds (Potoczak, 2013). Poorer regions use these sources of financing to intensify intervention in the development process for creating and sustaining the convergence.

Since the reforms in 1999, regional and local units of territorial administration have systematically increased their competences, taking over the responsibilities of the central administration (Dolnicki, 2012). There has also been growth in their ability to generate revenue through vehicles such as participation in income taxes from residents and businesses (Public Financial Act, 2009; Regional and Local Government's Income Act, 2003). Regional and local authorities have considerable freedom in formulating development goals and initiating actions conducive to the development of the territorial unit (Municipality Act, 1990; District Act, 1998; Voivodeship Act, 1998). Management of the development of territorial units in Poland is based on a hierarchical system of plans (strategies) formulated at different levels of territorial administration. They can be distinguished as follows (CM, 2009):

- long-term and medium-term strategy of the country and the national functional strategies
- trans-regional strategies (e.g. Strategy of Socioeconomic Development of Eastern Poland, 2020)
- regional development strategies and regional functional strategies,
- strategies for the development of districts and municipalities

The obligation of strategic planning does not include municipalities and districts, but in practice the vast majority of units prepare these documents at a local level. This article focuses not only on managing the development of the regions, but the conditions shaping this process, particularly because the methodology of planning and controlling strategies are universal and also apply to local units.

In the management literature the importance of strategic thinking is often stressed, which may be understood as an attribute of the persons responsible for achieving long-term goals (Porter, 1996; Abraham, 2005; Steptoe-Warren et. al., 2011). It should also be noted that the primary tool in this process is the strategy – the long-term plan of the activity (Mintzberg et. al., 1998). In Poland, at the regional and district level, strategic management relies mostly on strategic documents. In some municipalities where the same person is elected as mayor for multiple tenures the bigger role of strategic thinking than formal documents is visible.

The concept of strategic management is widely analyzed in the literature. Generally speaking, it is a way of modifying the organization by constantly providing care for following the vision for future activity (Eden & Ackermann, 2013). However, this proactive formula of strategic management requires adaptation to the requirements of public administration. In this perspective, following this vision requires the continuous monitoring of the strategy, modifying accepted assumptions of it, and adapting to changes in the environment, or even anticipating them (Krupski, 2007). Most often the full process of strategic management requires the following steps: (1) strategic analysis,

(2) planning the strategic tasks, (3) auditing and final inspection of the strategy realization (Dess & Miller 1993; Gierszewska & Romanowska, 1997). Other authors such as Thompson &. Stickland (1993) propose a similar but more extensive description.

The relatively low quality of strategic management in Polish public administration and awareness of the challenges standing before the administration makes those involved inclined to seek a different systemic solution which would provide an enhancement to the quality of the process (Strojny, 2012). This article presents just such an approach, based on a model developed by the author called STRAM – *Strategy or Administration Model* which is shown in Figure 1. It includes four stages of management: (1) preparation of the strategic information, (2) formulation of the objectives, (3) strategic planning, and (4) implementation of the strategy (including audit and final inspection). In the course mentioned, phases also include the use of four methods supporting the strategic management: (1) AHP (Analytic Hierarchy Process), (2) MBO (Management By Objectives), (3) benchmarking and (4), PM (Project Management).

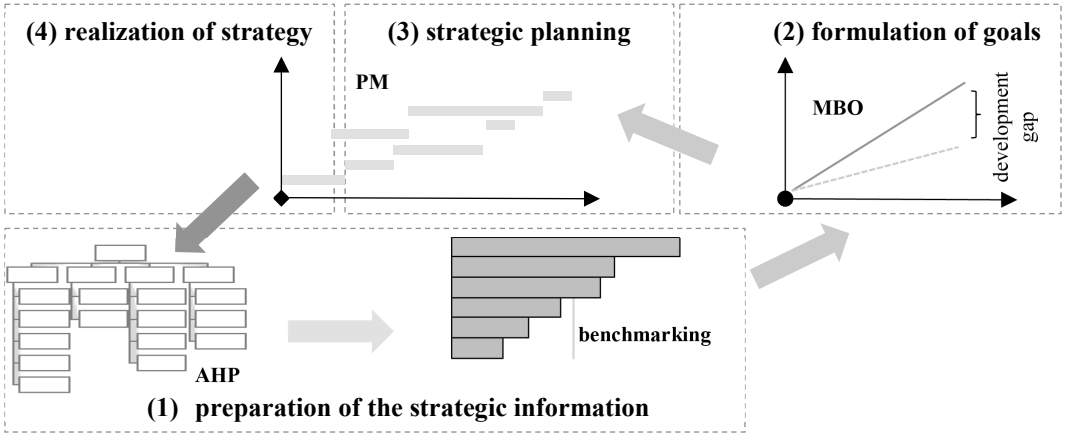

Figure 1. Diagram of strategy for administration model
Source: own work

The first method included in the model is the AHP. It was created by T.L. Saaty during the years 1970-1980 (Saaty, 1980). It is used to support decision-making processes by allowing the structuring of the problem and the analysis of the preferences (Saaty & Forman, 1992). It is one of the most popular methods of multi-criteria analysis in the world (Prusak et. al., 2014). It is used not only in scientific research, but is also applied to real decision-making processes including those in public institutions. Numerous case studies on the usage of the AHP in the decision-making processes in the public sector are listed in literature (Saaty, 2008; Awasthi, 2012; de Luca, 2013; Sayyadi & Georgiadou et. al., 2013). This shows that, despite a significant advancement in the life cycle of the AHP, this method is still being developed and adapted to changes in organizations and their environment. The presented applications are mostly implemented to solve specific problems, and so at the operational (project) level, implementation into the strategy is quite rare.

Benchmarking is another method used in the model. It is also very popular in management sciences. It has been applied since the 1970s at Xerox (Bogan & English, 1994; Kuczewska, 2007). It is widely known through the publications, among others, of

R.J. Boxwel (1994). This method helps improve organizations by comparing patterns (Balm, 1992; Anand & Kodali, 2008). Due to its efficiency, it has gained great popularity in the practice of management, not only in commercial organizations, but also in public institutions (Bowerman et. al., 2000, 2001, 2002; Angiola & Bianchi, 2015).

It is worth noting that performance management is largely based on the concept of MBO which is much older than the methods described above (Van Dooren et. al., 2014). It was described by P.F. Drucker (1954), and was then developed by G.S. Odiorne (1965). It can be seen as a comprehensive approach, aimed at orienting the organization toward the objectives (Carmen, 2014). Its essence is therefore, correcting the formulation and a continuous monitoring of implementation. Like the previous methods, the MBO is used to enhance the effectiveness of different types of organizations (Kyriakopoulos, 2012) including public administration (Moore &Staton 1981; Pojster & Streib, 1995).

The orientation toward goals is also a characteristic for the Project Management (PM) method which in the STRAM model is used to carry out the entire process of planning and implementation of the strategic tasks. The PM method was established during the Manhattan Project of World War II (Seymour & Hussein, 2014). It became widespread by the 1960s in many business activities, which resulted in the development of a number of approaches, including such well-known ones such as IPMA[2], PMI[3] and PRINCE2[4] (Kwak, 2003). These approaches differ significantly, but they all prepare the organization for efficient project management. PM allows the use of many techniques for planning and controlling projects or strategic programs (OGC, 2009; PMI, 2013; IPMA, 2013). Therefore, it is worth advocating its use in public administration (Abbasi& Al-Mharmah, 2000; Kuipers, et. al., 2014).

3. Competitiveness of regions – theory and AHP models

As previously discussed, the process of strategic management is one of the primary tools with which the authorities of public administration can shape development processes. This has an effect on the quality of life of residents, investment conditions, and the overall economic situation in the territorial unit. In the modern economic environment, competitiveness is of particular importance and is therefore one of the most important strategic attributes. It is a set of attributes of the entity that allow competition in the relevant market (Strategor, 2001). It affects the improvement of occupied competitive position and attractiveness in relation to the other competing entities (Feurer & Chaharbaghi, 1994; Moon & Newman, 1995).

The concept of competitiveness is mostly analyzed from either a marketing or management perspective in relation to companies (Walas-Trębacz, 2013; Flak & Głód 2014; Lucato et. al., 2015). However, today it is also the subject of research in the context of the development of territorial units especially the regions. Both in the past in the *Lisbon Strategy* and in the present in *Strategy Europe 2020*, the European Commission stresses the need to build a solid foundation for competitiveness. This phenomenon is also subject to continuous monitoring and evaluation in the context of the development of

[2] IPMA – International Project Management Association.
[3] PMI – Project Management Institute.
[4] PRINCE – Projects in a Controlled Environment.

both the entire European Union area and particular regions (Annoni & Dijkstra, 2013; EU, 2014, 2015).

In the case of entities, such as territorial units, understanding the competitiveness and analysis of this phenomenon requires the adoption of a market perspective. In order to identify the markets in which territorial units compete, and the parameters of competitiveness and the competitive position, some questions need to be answered. Some of these questions are as follows: (1) in which markets do the territorial units compete – who is the client? (2) on what is the rivalry between them based? (3) what instruments do they have shaping the process of competition and building a competitive position?

The concept of the market is one of the fundamental concepts in economics and requires no further discussion in this short paper. For the purposes of this research it was assumed that the market is a space for the exchange of certain goods between entities which both provide and consume them. The territorial unit (e.g. region) in this process can be treated as a supply site. The demand site is created by groups of stakeholders that are interested in living, investing and/or visiting in the territory. Discussion about this mechanism requires at least a brief appeal to the modern theory of regional development. It consists of many approaches, starting with the theory of comparative costs, exogenous development theory, the new theory of growth, convergence theory, theory of growth poles or new economic geography (Martin, 2003).

From the perspective of this article, the new growth theory based on the concepts of R.E. Lucas (1988, 1990) and P.M. Romer (1994, 1998) is particularly interesting. It is assumed that the process of economic growth may accumulate spatially, leading to the creation and deepening of differences in the development of territorial systems. Growth is endogenous and depends on endogenous potential as the main factor affecting the level and rate of growth of production. It consists of many elements which include people, knowledge, know-how, technology and financial capital, etc. Concentration of the development processes leads to growth centers especially around big metropolises. The process of formulating and developing such centers is described by the growth poles theory and new economic geography (Perroux, 1950; Krugman, 1995).

There is no denying that one of the important factors in the formation of growth centers, in addition to domestic factors, is capital transfers. Flows from poorer to richer regions cause a divergence phenomenon that is increasing the differentiation of development. Flows in the other direction help poorer territorial units to increase their low endogenous potential and lead to convergence. This refers to the process of equalizing the level of development (Linnemann et.al., 1965; Wojcik, 2008). Both of these processes create the fundamental dilemma in the policy of territorial development in the European Union. The concentration of the capital leads to higher competitiveness on the national or European level, but causes the atrophy of development functions in many poorer territories. On the other hand, supporting the process of convergence can be inefficient because of many structural barriers in lower developed regions. Therefore, the analysis of the competitiveness of regions is very important as an element of strategic thinking and management at all levels of public authority in Europe.

It can be assumed that there are markets of mobile capital – people and companies which change their location for living or investing. Transactions in this market therefore rely on

the decision concerning the selection of the territory. What the territory has to offer is generally described by the conditions that determine the possibility of development of the capital in a given location. People are taking into account factors determining quality of life and possibilities for a professional career. Enterprises analyze facilities that provide a high efficiency of production processes. Additionally, the literature recognizes the role of another market which significantly determines the development of regions. This is the tourist market (Ivanov & Webster, 2013). The choice of a specific tourist destination depends on many attributes of the region related to natural resources, infrastructure and culture and business environment (Crouch, 2010; Kaynak & Kara, 2012). Their conscious formation also affects the ability to generate processes of economic growth and development.

The competitiveness of regions has been described assuming the transactional point of view. Certainly, it can also be assessed from the point of view of the conditions prevailing in the territory that create the endogenous potential. While this point of view defines what the region has to offer, it may not reflect the actual interest of the customers. Therefore, competitiveness as attractiveness relative to certain groups should also be considered. This means that the activity of the customers (their tendency to choose a certain location) is also a measure of competitiveness. Based on these considerations two definitions were proposed:

- Competitiveness of the region is the level of its endogenous potential with respect to the level of endogenous potential in other units. Endogenous potential is constructed by the attributes of society, economy, environment, public administration institutions and infrastructure. The evaluation of these features can cause changes in the decisions citizens or companies make about a location. It may also affect the willingness of tourists to visit the region (D.1).

- Competitiveness of the region is its attractiveness, and therefore the ability to attract mobile capital and tourists. If people choose the territory as a place to live and develop their career, and companies invest there and develop innovations, it means that the territory is competitive in the market of mobile capital. If tourists want to visit the territory it means that it is competitive in the tourism market. If these entities choose the given territory, they build a foundation for socioeconomic development, economic growth and improvement of the standard of living (D.2).

On the basis of these definitions, two models of competitiveness were constructed and were used to assess the situation in the regions of Eastern Poland. Construction of these models is an attempt to answer the first detailed research question: How are the competitive positions of regions measured? (DRQ.1). Answering this question provided an operationalization of the definitions of D.1 and D.2 describing the competitiveness of regions by creating two hierarchical AHP models. At the level of criteria the main elements of competitiveness were identified, while at the sub-criteria statistical variables were specified. Based on the analysis of literature, two different points of view on this phenomenon appeared.

The first point of view stems from the belief that the region's competitiveness should be understood as its endogenous potential, or in other words the set of characteristics that describe it. This approach corresponds to the first definition of competitiveness (D.1).

The analysis does not diminish to the elements of endogenous potential closely associated with the process of production, which is characteristic to economic theories. In this research other areas that may affect the assessment of the quality of life and involve the wider process of socioeconomic development were taken into account, not just economic growth. In this way, a SEEGI model consists of five basic dimensions: society (P_s), economy (P_ec), environment (P_{en}), government (P_g) and infrastructure (P_i). The structure of the model is shown in Table 1.

Table 1
The AHP model of endogenic potential (SEEGI Model)

ENDOGENIC POTENTIAL OF THE REGION (P)			
P_s	**S**ociety	P_s1	Number of associations, social organizations and foundations to 10 000. inhabitants
		P_s2	Share of the working age population in the total population
		P_s3	Share of pre-working age population in the total population
		P_s4	Natural increase per 1 000 inhabitants
		P_s5	Average number of medical and dental consultations per capita
P_{ec}	**E**conomy	$P_{ec}1$	Share of people working in the group of people of working age
		$P_{ec}2$	Share of unemployed people in a group of people of working age
		$P_{ec}3$	Gross salary
		$P_{ec}4$	Gross value of fixed assets of companies on the entity
		$P_{ec}5$	Total industrial production sold per capita
P_{en}	**E**nvironment	$P_{en}1$	Emission of gas and dust pollutants per km^2
		$P_{en}2$	Discharge of industrial wastewater per km^2
		$P_{en}3$	Waste generated in the industry per km^2
		$P_{en}4$	Share of legally protected area in total area
		$P_{en}5$	Number of natural monuments on the 100 km^2
P_g	**G**overnment	P_g1	Own revenues of local and regional government per capita
		P_g2	Revenue from EU funds of local and regional government per capita
		P_g3	Investment expenditures of local and regional government per capita
		P_g4	Current expenditures on salaries of local and regional government per capita
		P_g5	Expenditures for debt service of local and regional government per capita
P_i	**I**nfrastructure	P_i1	Length of paved local and regional roads per capita
		P_i2	Average share of the population using the media networks in the total population
		P_i3	Number of inhabitants per 1 bed in a general hospital
		P_i4	Number of beds in tourist accommodations per 1 000 inhabitants
		P_i5	Museums including branches per 100 km^2

Source: own work.

It is also worth considering how the endogenous potential affects the behavior of different types of entities which choose the region as the area of their activity. In this way, a model for evaluating the attractiveness of the region was prepared with respect to selected groups of stakeholders – the TCB model. It takes into account the activity of tourists (A_t), citizens (A_c) and enterprises (A_b). It is presented in detail in Table 2.

Table 2
The AHP model of attractiveness (TCB Model)

ATTRACTIVENESS OF THE REGION (A)			
A_t	Attractiveness in respect to the **t**ourists	A_t1	Number of Polish tourists
		A_t2	Number of foreign tourists
		A_t3	Average duration of the tourist stay
		A_t4	Expenditures in gastronomy per capita
A_c	Attractiveness in respect to the **c**itizens	A_c1	Net international migration per 100 000 inhabitants
		A_c2	Net inter-voivodeships migration per 100 000 inhabitants
		A_c3	Number of occupied housing per 1 000 inhabitants
		A_c4	Number of live births per 1 000 inhabitants
A_b	Attractiveness in respect to the **b**usiness	A_b1	Investments by private sector per entity
		A_b2	Number of commercial companies per 1 000 inhabitants
		A_b3	Number of commercial companies with foreign capital per 1 000 inhabitants
		A_b4	Total expenditures on R&D per entity in economy

Source: own work.

A full assessment of the competitiveness requires consideration of both of the models described above. Comparative assessment of the endogenous potential indicates the possibility of improving individual dimensions of reality in the region. It allows a better definition of specialization and the real possibility of maintaining the existing capital or acquiring a new one. Rating the attractiveness shows how existing potential is efficiently utilized and fosters a competitive advantage in the tourism market or the markets of mobile capital.

4. A multi-criteria comparative analysis of the competitiveness of Eastern Poland

A Polish territory was selected as the test area and included the following regions: LUBELSKIE, PODKARPACKIE, PODLASKIE ŚWIĘTOKRZYSKIE and WARMIŃSKO-MAZURSKIE. These areas are located on the eastern border of the country, and have a relatively low level of development e.g. by GDP[5] per capita. These regions are also drained by large metropolitan areas in the country such as Warsaw (capital of the country), Krakow (in the south) and the tri-city metropolis (Gdansk, Gdynia and Sopot) in the north. The selected regions therefore have much in common and have to face similar developmental problems. In Polish literature and regional policy they are often analyzed under the name of Eastern Poland. At this level, there are statistical databases available which are useful for measuring competitive position. The analysis of competitiveness is multidimensional and requires the use of quite complex methods. On the other hand, all the procedures presented in the analysis should be able to be implemented in the real strategic management. The assumptions of the research presented in this paper meet both of these requirements. The multi-criteria analysis provided below allows a reduction of the analysis of the compounded reality to one aggregated evaluation (Dodgson et. al, 2009).

[5] GDP – gross domestic product.

The first step of the analysis was to assess the importance of the elements of competitiveness using to the SEEGI and TCB models. The significance of the different dimensions of competitiveness and statistical data describing these dimensions were assessed for the individual models using Saaty's scale. The group of experts consisted of 7 persons who deal with issues of regional development and work in the Department of Economics at Rzeszow University of Technology. They are familiar with the different theories of regional development and understand the situation in the regions of Eastern Poland as well. As a result of the judgments, the weights of the local criterion (w_c), and sub-criteria (w_{sc}) were calculated. They were used to build the aggregate indexes at both the level of dimensions of competitiveness ($I_{(d)}$) and the level of general index ($I_{(g)}$). These analyses were performed for both constructed models (Tables 3 and 4).

Table 3
Weights of elements of the endogenic potential (SEEGI Model)

Indexes	P_s	P_{ec}	P_{en}	P_g	P_i	P_s1	P_s2	P_s3	P_s4	P_s5	$P_{ec}1$	$P_{ec}2$	$P_{ec}3$	$P_{ec}4$	$P_{ec}5$
Weights (W_i, W_j)	0.21	0.27	0.18	0.18	0.16	0.08	0.38	0.23	0.23	0.08	0.29	0.16	0.11	0.14	0.30
Indexes	$P_{en}1$	$P_{en}2$	$P_{en}3$	$P_{en}4$	$P_{en}5$	P_g1	P_g2	P_g3	P_g4	P_g5	P_i1	P_i2	P_i3	P_i4	P_i5
Weights (W_i, W_j)	0.29	0.28	0.23	0.12	0.08	0.34	0.20	0.23	0.09	0.14	0.28	0.26	0.25	0.12	0.09

Source: own work

Table 4
Weights of elements of the attractiveness (TCB Model)

Indexes	A_t	A_c	A_b	A_t1	A_t2	A_t3	A_t4	A_c1	A_c2	A_c3	A_c4	A_b1	A_b2	A_b3	A_b4
Weights (W_i, W_j)	0.16	0.28	0.56	0.13	0.28	0.30	0.29	0.19	0.16	0.18	0.47	0.10	0.21	0.32	0.37

Source: own work

The basic problem in the construction of aggregated measures is a variety of statistical data used to describe the dimensions of competitiveness. They have different units, and thus need to be normalized. This requires the use of the formulas of normalization. It means the transformation of the original variables (v_i) with different units of measurement, into variables of the same units (n_i). In the literature, numerous examples of the testing of the different formulas of normalization can be found. This article presents results based on a formula of zero-unitarisation and therefore the reference point is the extent of the range of variables $R=\max(v_i) - \min(v_i)$. Equation 1 for stimulants and Equation 2 for destimulants is used here:

$$n_i = \frac{v_i - \min(v_i)}{\max(v_i) - \min(v_i)} \quad (1)$$

$$n_i = \frac{\max(v_i) - v_i}{\max(v_i) - \min(v_i)} \quad (2)$$

The normalization procedure made it possible to bring the values of the variables to a range $n_i \in \langle 0;1 \rangle$. The indexes for the criteria of competitiveness (Equation 3) and the general index (Equation 4) were constructed on this basis.

$$I_{(d)i} = \sum_{i=1}^{n} v_i \cdot w_{sc} \quad (3)$$

$$I_{(g)i}=\sum_{i=1}^{n} I_{(d)i} \cdot w_c \qquad (4)$$

In the analysis of trends the single-based indices (I_{sb}) were used. The values of variable $x_i \in (n_i, I_{(d)}, I_{(g)})$ for any year of the time period (y_i) were referenced to the value of variable in the based year y_b=2009[6]. Equation 5 is used here:

$$I_{sb}(y_i)=\frac{x_i(y_i)}{x_i(y_b)} \qquad (5)$$

When single-based indexes value below $I_{sb}(y_i) \in \langle 0;1)$, it means a regression in the year y_i as compared to the base year y_b. The value $I_{sb}(y_i)=1$ means stagnation, and values $I_{sb}>1$ indicate a development.

Based on the constructed models, the database of statistic variables was built on the basis of publicly available (non-commercial) official sources. Appropriate, simple operations including normalization of data, aggregation of indexes and calculation of single-based indexes have also been provided. The study included all Polish regions. This article focuses on the presentation of the situation in the regions of Eastern Poland. The results of the study were presented with reference to the research questions posed earlier. An attempt to answer the detailed question, "what is the competitive position of particular regions of Eastern Poland? (DRQ.2)", calculated values of all indicators of the endogenous potential and attractiveness of all investigated regions. The results are shown in Table 3 (on the level of aggregated indexes).

Table 5
Indexes of competitiveness of regions of Eastern Poland in 2013

Nr	Region	Indexes of the competitiveness									
		Indexes of endogenic potential (P, P_i)						Indexes of attractiveness (A, A_i)			
		P	P_s	P_{ec}	P_{en}	P_g	P_i	A	A_t	A_c	A_b
1	LUBELSKIE	0.39	0.41	0.11	0.77	0.36	0.45	0.21	0.08	0.45	0.13
2	PODKARPACKIE	0.49	0.69	0.17	0.84	0.45	0.44	0.33	0.15	0.48	0.31
3	PODLASKIE	0.44	0.51	0.13	0.85	0.46	0.43	0.19	0.07	0.43	0.11
4	ŚWIĘTOKRZYSKIE	0.32	0.28	0.09	0.53	0.40	0.46	0.13	0.13	0.31	0.04
5	WARMIŃSKO-MAZURSKIE	0.49	0.82	0.04	0.90	0.44	0.41	0.19	0.16	0.47	0.05

Source: own work based on national statistical data (CSO).

The endogenous potential of the regions of Eastern Poland has medium or low evaluations. At the level of the main index (P) PODKARPACKIE and WARMIŃSKO-MAZURSKIE (P=0.49) obtained the highest values. The voivodeship with the highest endogenous potential in the country is MAZOWIECKIE (P=0.62). The weakest in the country is one of the regions of Eastern Poland – ŚWIĘTKORZYSKIE (P=0.32). The analyzed regions still have a high social potential (P_s). Characterizing them particularly, it is worth listing WARMIŃSKO-MAZURSKIE, which is the best region in the country

[6] The year of 2009 is the first year of the time series in presented research.

(P_s=0.82) and also PODKARPACKIE (P_s=0.69). Other regions of Eastern Poland experience a strong drainage mainly from the metropolis of Warsaw. The weakest in the country in the area of society is ŚWIĘTOKRZYSKIE (P_s=0.28).

A much bigger difference between regions can be observed in the case of economic potential (P_{ec}). Here MAZOWIECKIE (P_{ec}=0.94) showed a significant advantage over the rest of the regions. The best of the regions in Eastern Poland proved to be PODKARPACKIE (P_{ec}=0.17). The weakest in Poland is another eastern region – WARMIŃSKO-MAZURSKIE (P_{ec}=0.04). Other eastern regions also have very low levels of economic potential. In others, it is the potential of environment (P_{en}). The examined regions, located in the east of the country retained their rural character. The relatively weak economic development therefore, affects the purity of the environment. The best in the country turns out to be WARMIŃSKO-MAZURSKIE (P_{en}=0.90). High marks were also received by other regions of Eastern Poland. The least is ŚWIĘTOKRZYSKIE (P_{en}=0.53). The worst environmental assessment in the country is achieved by ŚLĄSKIE (P_{en}=0.28).

Another dimension of the potential refers to the efficiency of institutions of regional and local government (P_g) which was assessed from the perspective of the budget (public revenues, expenditures and debt). Polish eastern regions fall on a level of average or poor in terms of this indicator. The best situation is in PODLASKIE (P_g=0.46), while the worst is in LUBELSKIE (P_g=0.36). The highest potential of regional and local government institutions in the country is DOLNOŚLĄSKIE (P_g=0.66), and the lowest is OPOLSKIE (P_g=0.28). The activity of public institutions affects the level of potential of infrastructure. This is quite aligned in Eastern Poland regions who received assessments in scope $P_i \in \langle 0.41;0.46 \rangle$. The best in Poland is ZACHODNIOPOMORSKIE (P_i=0.63), while the worst is POMORSKIE (P_i=0.31).

The conducted study also allows for a more complex analysis. From the point of view of strategic management it is important to identify the strengths and weaknesses of endogenic potential. This information can be accessed by going down to the most detailed level of analysis which consists of the standardized statistical variables. The study assumed that a feature of the endogenous potential is weak if the variable value of standardized $n_i \leq 0.30$, and strong, if $n_i \geq 0.80$. A summary of particular regions is detailed in Table 6.

Table 6
The analysis of strengths and weaknesses of regions of Eastern Poland in 2013

Strengths ($n_i \geq 0.70$):	**Weaknesses ($n_i \leq 0.30$):**
LUBELSKIE	
· P_s5. Average number of medical and dental consultations per capita. · $P_{en}1$. Emission of gas and dust pollutants per km^2 · $P_{en}2$. Discharge of industrial wastewater per km^2. · $P_{en}3$. Waste generated in the industry per km^2. · P_g3. Investment expenditures of local and regional government per capita. · P_g5. Expenditures for debt service of local and regional government per capita. · P_i1. Length of paved local and regional roads per capita. · P_i3. Number of inhabitants per 1 bed in a general hospital.	· P_s2. Share of the working age population in the total population. · $P_{ec}1$. Share of people working in the group of people of working age. · $P_{ec}3$. Gross salary. · $P_{ec}4$. Gross value of fixed assets of companies on the entity. · $P_{ec}5$. Total industrial production sold per capita. · $P_{en}5$. Number of natural monuments on the 100 km^2. · P_g1. Own revenues of local and regional government per capita. · P_g2. Revenue from EU funds of local and regional government per capita. · P_i2. Average share of the population using the media networks in the total population. · P_i4. Number of beds in tourist accommodations per 1 000 Inhabitants. · P_i5. Museums including branches per 100 km^2.
PODKARPACKIE	
· P_s3. Share of pre-working age population in the total population. · P_s4. Natural increase per 1 000 inhabitants. · $P_{en}1$. Emission of gas and dust pollutants per km^2. · $P_{en}2$. Discharge of industrial wastewater per km^2. · $P_{en}3$. Waste generated in the industry per km^2. · P_g3. Investment expenditures of local and regional government per capita. · P_g5. Expenditures for debt service of local and regional government per capita.	· $P_{ec}1$. Share of people working in the group of people of working age. · $P_{ec}2$. Share of unemployed people in a group of people of working age. · $P_{ec}3$. Gross salary. · $P_{ec}5$. Total industrial production sold per capita. · $P_{en}5$. Number of natural monuments on the 100 km^2. · P_g1. Own revenues of local and regional government per capita. · P_i4. Number of beds in tourist accommodations per 1 000 inhabitants. · P_i5. Museums including branches per 100 km^2.
PODLASKIE	
· P_s5. Average number of medical and dental consultations per capita. · $P_{en}1$. Emission of gas and dust pollutants per km^2. · $P_{en}2$. Discharge of industrial wastewater per km^2. · $P_{en}3$. Waste generated in the industry per km^2. · P_g3. Investment expenditures of local and regional government per capita. · P_g5. Expenditures for debt service of local and regional government per capita. · P_i1. Length of paved local and regional roads per capita.	· $P_{ec}1$. Share of people working in the group of people of working age. · $P_{ec}3$. Gross salary. · $P_{ec}4$. Gross value of fixed assets of companies on the entity. · $P_{ec}5$. Total industrial production sold per capita. · $P_{en}5$. Number of natural monuments on the 100 km^2. · P_g1. Own revenues of local and regional government per capita. · P_g2. Revenue from EU funds of local and regional government per capita. · P_i2. Average share of the population using the media networks in the total population. · P_i4. Number of beds in tourist accommodations per 1 000 inhabitants. · P_i5. Museums including branches per 100 km^2.

ŚWIĘTOKRZYSKIE	
· P_s5. Average number of medical and dental consultations per capita. · P_{en}1. Emission of gas and dust pollutants per km^2. · P_{en}4. Share of legally protected area in total area. · P_g3. Investment expenditures of local and regional government per capita. · P_g5. Expenditures for debt service of local and regional government per capita. · P_i1. Length of paved local and regional roads per capita.	· P_s2. Share of the working age population in the total population. · P_s3. Share of pre-working age population in the total population. · P_s4. Natural increase per 1 000 inhabitants. · P_{ec}1. Share of people working in the group of people of working age. · P_{ec}2. Share of unemployed people in a group of people of working age. · P_{ec}3. Gross salary. · P_{ec}4. Gross value of fixed assets of companies on the entity. · P_{ec}5. Total industrial production sold per capita. · P_{en}5. Number of natural monuments on the 100 km^2. · P_g1. Own revenues of local and regional government per capita. · P_g2. Revenue from EU funds of local and regional government per capita. · P_i2. Average share of the population using the media networks in the total population. · P_i4. Number of beds in tourist accommodations per 1 000 inhabitants. · P_i5. Museums including branches per 100 km^2.
WARMIŃSKO-MAZURSKIE	
· P_s1. Number of associations, social organizations and foundations to 10 000 inhabitants. · P_s2. Share of the working age population in the total population. · P_s3. Share of pre-working age population in the total population. · P_{en}1. Emission of gas and dust pollutants per km^2. · P_{en}2. Discharge of industrial wastewater per km^2. · P_{en}3. Waste generated in the industry per km^2. · P_g3. Investment expenditures of local and regional government per capita.	· P_{ec}1. Share of people working in the group of people of working age. · P_{ec}2. Share of unemployed people in a group of people of working age. · P_{ec}3. Gross salary. · P_{ec}4. Gross value of fixed assets of companies on the entity. · P_{ec}5. Total industrial production sold per capita. · Pg1. Own revenues of local and regional government per capita. · P_g2. Revenue from EU funds of local and regional government per capita. · P_i5. Museums including branches per 100 km^2.

Source: own work.

The list of strengths and weaknesses precisely indicate areas of improvement and possible foundations for further development of the regions surveyed. Undoubtedly, one of the greatest assets of the investigated regions is a clean environment. The development strategies in these regions in the long term must therefore focus on industries that use this element of potential (i.e. organic agriculture or tourism). It should also be noted that the development potential of the industry should not cause hazards for clean air, soil or water. In most cases, regions of Eastern Poland also have a young population. This is a strength now, but is affected by high foreign or interregional migration which will greatly weaken its social potential in the future. It is worth noting that all of the tested regions have a problem with building advantages based on the identified strengths. The younger part of society creates an attractive labor market. Unfortunately, both the level of economic activity and unemployment are among the weaknesses of the whole analyzed area of Eastern Poland. It is worth noting that a clean environment is also not used in a sufficient manner for the tourist market. The surveyed regions have an underdeveloped tourist infrastructure (accommodation, museums, etc.) in comparison to the rest of the country which weakens its attractiveness for the tourism market.

The second assessment is based on the TCB model and concerns the analysis of the attractiveness of the regions in selected markets – the tourism market, the market of mobile human capital and the market of mobile investment capital. It is worth emphasizing that there is a high differentiation of attractiveness of regions in the country. At the level of the main index (A) MAZOWIECKIE (A=0.94) showed a significant advantage over others. Another region, MAŁOPOLSKIE, showed significantly lower scores (A=0.59). In this context, the attractiveness of regions of Eastern Poland should be assessed as low or average. The best is PODKARPACKIE (A=0.33), while the weakest is ŚWIĘTOKRZYSKIE (A=0.19) which is also the least attractive region in the country.

The differences in assessing the attractiveness of the tourism market are much smaller. The two leading regions are MAZOWIECKIE (A_t=0.69) and MAŁOPOLSKIE (A_t=0.59). Eastern regions are weak here – $A_t \in \langle 0.07; 0.16 \rangle$. MAZOWIECKIE ($A_c$=0.97) is the best in Poland with regards to attractiveness with respect to citizens while the worst is OPOLSKIE (A_c=0.13). The assessment of the regions of Eastern Poland is at an average level – $A_c \in \langle 0.43;0.48 \rangle$, except ŚWIĘTOKRZYSKIE which scored less (A_c=0.31). The last aggregated indicator concerns the evaluation of the attractiveness with respect to companies. Here again, by far the best is MAZOWIECKIE (A_b=1.00). Another region, DOLNOŚLĄSKIE, received a much lower score (A_b=0.39). In this background PODKARPACKIE (A_b=0.31) did relatively well – the core place of this region as the fifth in the country. Other regions of Eastern Poland are much less attractive. The weakest were WARMIŃSKO-MAZURSKIE (A_b=0.05) and ŚWIĘTOKRZYSKIE (A_b=0.04).

Similar to endogenous potential, attractiveness can also be analyzed considering more detailed information. This analysis considers the market situation, and therefore consists of external factors of development. Therefore, they seek market opportunities and threats (Table 7).

Table 7
The analysis of market opportunities and threats of regions of Eastern Poland in 2013

Opportunities ($n_i \geq 0.70$):	**Treats ($n_i \leq 0,30$):**
LUBELSKIE	
· A_c1. Net international migration per 100 000 Inhabitants.	· A_t1. Number of Polish tourists. · A_t2. Number of foreign tourists. · A_t3. Average duration of the tourist stay. · A_t4. Expenditures in gastronomy per capita. · A_c2. Net inter-voivodeships migration per 100 000 inhabitants. · A_b2. Number of commercial companies per 1 000 inhabitants. · A_b3. Number of commercial companies with foreign capital per 1 000 inhabitants. · A_b4. Total expenditures on R&D per entity in economy.
PODKARPACKIE	
· A_c1. Net international migration per 100 000 inhabitants. · A_b1. Investments by private sector per entity. ·	· A_t1. Number of Polish tourists. · A_t2. Number of foreign tourists. · A_t4. Expenditures in gastronomy per capita. · A_c2. Net inter-voivodeships migration per 100 000 inhabitants. · A_c3. Number of occupied housing per 1 000 inhabitants. · A_b2. Number of commercial companies per 1 000 inhabitants. · A_b3. Number of commercial companies with foreign capital per 1 000 inhabitants.
PODLASKIE	
· A_c1. Net international migration per 100 000 inhabitants.	· A_t1. Number of Polish tourists. · A_t2. Number of foreign tourists. · A_t3. Average duration of the tourist stay. · At4. Expenditures in gastronomy per capita. · A_c2. Net inter-voivodeships migration per 100 000 inhabitants. · A_c4. Number of live births per 1 000 Inhabitants. · A_b1. Investments by private sector per entity. · A_b2. Number of commercial companies per 1 000 inhabitants. · A_b3. Number of commercial companies with foreign capital per 1 000 inhabitants. · A_b4. Total expenditures on R&D per entity in economy.
ŚWIĘTOKRZYSKIE	
· A_c1. Net international migration per 100 000 inhabitants.	· A_t1. Number of Polish tourists. · A_t2. Number of foreign tourists. · A_t4. Expenditures in gastronomy per capita. · A_c2. Net inter-voivodeships migration per 100 000 inhabitants. · A_c4. Number of live births per 1 000 inhabitants. · A_b1. Investments by private sector per entity. · A_b2. Number of commercial companies per 1 000 inhabitants. · A_b3. Number of commercial companies with foreign capital per 1 000 inhabitants. · A_b4. Total expenditures on R&D per entity in economy.

WARMIŃSKO-MAZURSKIE	
· A_c1. Net international migration per 100 000 inhabitants.	· A_t1. Number of Polish tourists. · A_t2. Number of foreign tourists. · A_t3. Average duration of the tourist stay. · A_t4. Expenditures in gastronomy per capita. · A_c2. Net inter-voivodeships migration per 100 000 inhabitants. · A_b1. Investments by private sector per entity. · A_b2. Number of commercial companies per 1 000 inhabitants. · A_b3. Number of commercial companies with foreign capital per 1 000 inhabitants. · A_b4. Total expenditures on R&D per entity in economy.

Source: own work

In all the surveyed regions, the analysis did not allow for a clear identification of market opportunities which would provide a highly competitive position. Instead, all of the investigated areas showed threats to development rather than opportunities. There has been a very weak interest in the studied regions in the tourist market despite the fact that the potential of the natural environment is significant. In the market of mobile human capital there is a particular problem of interregional migration mainly due to the influence of Warsaw. This metropolis is also a strong magnet for investment capital. The examined regions are unable to obtain satisfactory levels in attractiveness to both domestic as well as foreign companies. In this area, only PODKARPACKIE is a region with an acceptable level of attractiveness. Potentially, a great opportunity for the development of this region is the investment activity of the private sector (A_b1=0.78) and expenditure on R&D (A_b4=0.59).

Strategic decision-making in managing the development of the regions also needs to take into account trends during all of the time period from 2009-2013. To describe these trends, single-based indexes were calculated for each year using 2009 as the base year. The choice of date is dictated by both the availability of statistical data (in the case of variables in the SEEGI model) as well as the onset of the economic crisis. The selected time period may therefore provide interesting information on the impact of the crisis on the regions studied. The results are shown in Table 8.

Table 8
Single-based indexes for indexes of competitiveness of regions of Eastern Poland in 2013 with respect to 2009

Nr	**Region**	**Single based indexes for indexes of the competitiveness**									
		Single based indexes for indexes of endogenic potential (P, P_i)						**Single based indexes for indexes of attractiveness (A, A_i)**			
		$I_s(P)$	$I_s(P_s)$	$I_s(P_{ec})$	$I_s(P_{en})$	$I_s(P_g)$	$I_s(P_i)$	$I_s(A)$	$I_s(A_t)$	$I_s(A_c)$	$I_s(A_b)$
1	LUBELSKIE	1.13	1.07	1.02	1.00	2.16	1.05	0.86	0.81	0.93	0.78
2	PODKARPACKIE	1.14	1.18	1.07	1.01	1.46	1.11	1.48	0.98	1.08	2.30
3	PODLASKIE	1.00	1.29	0.90	1.00	0.87	0.91	1.02	0.97	0.93	1.26
4	ŚWIĘTOKRZYSKIE	0.94	0.90	0.97	1.00	0.86	1.00	0.62	1.14	0.79	0.27
5	WARMIŃSKO-MAZURSKIE	1.08	1.04	0.82	1.00	1.51	1.10	0.70	0.82	0.78	0.42

Source: own work based on national statistical data (CSO)

Three of the regions studied improved their endogenous potential (P) in the period since 2009. The fastest increase is observed in the PODKARPACKIE and LUBELSKIE regions. An indicator of the overall potential (P) increased by 14% (the highest growth of potential in the country) and 13% respectively. During the same time, the potential of ŚWIĘTOKRZYSKIE decreased by 6%. The worst situation in the country was identified in the LUBUSKIE region, where the potential had fallen by 8%. The fastest growing social potential (Ps) in Poland was evident in the improvement in the PODLASKIE (ΔP_s=+29%) and PODKARPACKIE (ΔP_s=+18%) regions. The worst situation is in ŚWIĘTOKRZYSKIE (ΔP_s=-10%), while the worst in the country is ŁUDZKIE (ΔP_s=-39%). When it comes to the economic potential (P_{ec}), in the analyzed period, it improved in LUBELSKIE (ΔP_{ec}=+2%) and PODKARPACKIE (ΔP_{ec}=+7%). WARMIŃSKO-MAZURSKIE (ΔP_{ec}=-18%) had the fastest decreasing rate in the country. It is worth noting that the fastest growth rate was recorded in the economic potential of LUBUSKIE (ΔP_{ec}=+20%). This is a result of significant dynamics of change characterized by the institutional capacity of local government (P_g). The index has more than doubled in LUBELSKIE (ΔP_g=+116%) and it was the best result in the country. PODKARPACKIE (ΔP_g=+46%) and WARMIŃSKO-MAZURSKIE (ΔP_g=+51%) also significantly improved their situation. In PODLASKIE and ŚWIĘTOKRZYSKIE the situation worsened. The biggest drop in the country was recorded in OPOLSKIE (ΔP_g=-24%). The last dimension is the potential of infrastructure (P_i). Its relative assessment in the case of the regions PODKARPACKIE and WARMIŃSKO-MAZURSKIE has increased – by 11% and 10% respectively. In other regions of Eastern Poland it declined.

Only a few regions were clearly distinguished in the examined years regarding the attractiveness of markets (A). The two most attractive regions– MAZOWIECKIE and MAŁOPOLSKIE – improved their position by 3% and 4% respectively. The spectacular growth of the overall attractiveness index was also recorded in PODKARPACKIE (ΔA=+48%). The eastern region to most lose its attractiveness was ŚWIĘTOKRZYSKIE (ΔA=-38%). At the same time, this region improved its attractiveness in the tourist market (A_t) by 14%. This is the highest growth rate in the country in this market. Other regions of the Eastern Poland that lost the most attractiveness were LUBELSKIE (ΔA_t=-19%) and WARMIŃSKO-MAZURSKIE (ΔA_t-18%). LUBUSKIE (ΔA_t=-43%) lost the most competitiveness in the tourism market. In the case of the market of mobile human capital (A_c), the fastest improvement in competitiveness was MAZOWIECKIE (ΔA_c=+12%). From the regions of Eastern Poland, the situation has improved for PODKARPACKIE (ΔA_c=+8%). The attractiveness of the other eastern regions has dropped from 3% in PODLASKIE to 22% in WARMIŃSKO-MAZURSKIE (the worst result in the country). PODKARPACKIE very quickly improved its situation in the market of mobile investment capital (A_b). During the analyzed period, the increase rate was ΔA_b=+130%. A significant increase (ΔA_b=+ 26%) was also observed in the region of PODLASKIE. The competitiveness of other regions in this market fell with the most being in ŚWIĘTOKRZYSKIE (ΔA_b=-73%).

Even a simple analysis of the dynamics of change can significantly enrich the management information in relation to statistical analysis. It is worth noting that the examined regions benefit from the opportunities offered by the European Union's cohesion policy to maintain endogenous potential and even improve it. For the period 2009-2013 the PODKARPACKIE region showed improvement in all areas of the

endogenous potential. This region is also unique in terms of improving its attractiveness in particular in relation to businesses. This observation is very useful for the other eastern regions which should look for their path of development on the basis of the benchmark of PODKARPACKIE. The intensive support which regional and local authorities ensure to the innovative sectors (especially connected with the aviation industry) is especially interesting. This direction is based on the well-recognized attributes of the region resulting from the historical traditions of this industry in the analyzed region.

5. Conclusions

This study focused on two aspects. The first is the cognitive aspect which is concerned with the assessment of the competitive position of regions of Eastern Poland. The second is the methodological aspect which instead preferred to present the AHP method in the context of the preparation of strategic information in public administration.

The relatively low endogenous potential (especially in the economic dimension) and low attractiveness in terms of basic stakeholder groups should be noted in reference to the cognitive aspect. Among the analyzed regions, PODKARPACKIE stands out positively and ŚWIĘTOKRZYSKIE negatively. It is worth noting that a detailed SWOT analysis based on verified models indicates the existence of significant barriers of development in all regions of Eastern Poland. Both the weaknesses in their potential and processes that threaten their competitive position on markets are observed.

The possibility of adapting the method of AHP to the procedure of strategic management in public administration should be mentioned in reference to the methodological aspect. The research approach used in this article involves one of many possible forms of application of this method to the practice of strategic management. The example was limited to the activities related to the preparation of strategic information. In this role, the AHP method, linked to the process of normalization of statistical variables allows the performance of a simple multi-criteria comparative analysis. The statistical data used provides a general but comprehensive picture of the situation in a territorial unit, especially using both the SEEGI and TCB model.

Attention should also be paid to the potential problems associated with the application of the approach proposed in the article. One of them is the limitation of statistical variables and a procedure for updating the database. The use of the aggregation of variables requires the same time period for all the variables used. The databases are updated with some delay of approximately one year which means that it is possible to prepare mainly an ex-post analysis. In this situation, an acceptable solution might be to forecast trends for 2-3 consecutive years compared to the last year in the available time period. The testing of methods of forecasting and their inclusion in the procedure of analysis presented in this article is the next step in the planned research.

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