Relocation trends determined by increasing risks in Eastern Europe: An ANP-TOPSIS approach

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Abstract.

BACKGROUND: The COVID-19 pandemic has changed companies' perspective on relocation and brought uncertainty into people's lives. Uncertainty, a decisive factor in today's global environment, requires new research about human resources and companies. The COVID-19 pandemic has caused an unexpected need for change within organizations, especially in terms of human resources management, creating a complex and challenging environment that interferes with business continuity, forcing employees to cope with this challenging situation.

OBJECTIVE: The article aims identifying the changes generated by the COVID 19 pandemic in the relocation of businesses from the European Union, assessing the relocation trends of companies around the world in European countries in this volatile macroeconomic environment. The sustainability of companies, the way they can overcome the crises generated by the pandemic depend mainly on economic, social, financial, political factors and human resource involved in the relocation process. Studying the influence of the pandemic on relocation decision contributes to better management of crises in the future and to reducing risks.

METHODS: The study proposes an integrated ANP-TOPSIS (Analytic Network Process- Technique for Order of Preference by Similarity to Ideal Solution) for ordering preference according to the ideal solution framework. Priority should be given to solutions that consider the interactions between factors involved in decision-making. The proposed model will increase the efficiency of the transfer decision-making process and help managers choose solutions effectively based on their importance and impact on the company and the human resources involved.

RESULTS: The synthesis of the indicators and methods used, in addition to the factors that affect relocation, complements the specialized literature. The results showed a shift in business relocation options from east to west, demonstrating the current trend in the relocation issue associated with the COVID-19 virus. Eastern European countries are no longer as attractive for companies relocating compared to the pre-pandemic period. The countries with more stable economies, characterized by lower risks, seem to become more attractive to companies that relocate their facilities.

CONCLUSIONS: The strategic positioning of the firm, its growth or adaptation to the present environment, and its geographic focus are fundamental components of a company's migration. The selection of an ideal site is a research problem; not only to find a place where firms will have access to qualified human resources, to lower their costs, to be close to raw materials or the market, but also to prevent associated relocation hazards. According to research, today's reality necessitates a risk-focused strategy.
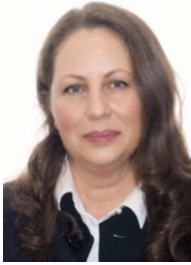
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1. Introduction

Relocation is one of the most debated features of economic globalization. Until the COVID-19 pandemic, companies were choosing sites to relocate for benefits in terms of profits, costs, and economies of scale. The major events in recent times have determined the company's orientation according to political stability and a priority health system with a significant share in GDP.

In recent decades, relocation has been an important factor that has influenced economic development. During this period, companies have integrated their business into a global value system. Pandemic waves have affected economic sectors, thus devel-

oping new approaches to crisis management. Studies about social distancing have established the effects generated by the COVID-19 pandemic on people, economies, and states [1]. Global economies can lead to the revitalization of contributions, scientific collaborations, and specific strategies, thus generating the adoption of new technologies against the background of the COVID-19 pandemic with the help of government support [2].

Governments have a key role to play in supporting SMEs and have an indispensable role in stimulating business activities, providing a major share of GDP that drives the economy [3].

In this research, 34 European states were considered relocation options for companies in Europe The relocations factors and supporting indicators demonstrated by various researchers have been identified in the literature. After their identification and grouping, they resulted in 8 criteria and 34 sub-criteria. The criteria pursued were human resources, infrastructure, education, environmental factors, science and technology, poverty, and social exclusion. The aim of the research is to build a decision-making model for companies, countries and authorities on the criteria that determine the relocation, measurement indicators and possible locations within European countries. The research consists of five parts. In the next section, a synthesis of the literature was made, of the most relevant works explicitly focused on relocations. The third section outlines a theoretical framework of the methodology, followed by database study. The fourth section contains the empirical findings, and the implications followed by limitation. In the last section, a summary of the findings was provided and a discussion of their implications.

2. Literature review

2.1. Relocation literature

The broad relocation context was able to be defined through the study of literature, limits of the subject, the current trends, factors determining relocation, and the methods used by different researchers. The general theoretical framework of relocation is the result of location theory, [4]. According to this theory, the main forces that lead to the relocation of companies are the expansion and the need for more appropriate premises. Another reason is that companies seek to take advantage of lower production costs, specific to other markets. Due to the economic downturn, orga-

nizations are facing challenges in making investment portfolio decisions. When resources have dwindled, decision-makers need to manage risk, considering the current economic environment.

Spatial flow models were used and the impact of economic and labour structures was considered to draw conclusions using the traditional theory of migration [5]. A general analysis of the research indicates that the geographical location of economic activity and its importance to companies, have been the subject of several studies [6–11]. The decision-making context is related to political, environmental, legal, administrative and market aspects [12]. Political pressure and government subsidies play a significant role in relocating the company. Marginal income is an objective of organizations, relocation being a solution for them, to achieve favourable cost conditions [9]. To give decision makers more flexibility, a new model for uncertainty conditions was proposed, consisting of an algorithmic methodology [13]. Organizations tend to gain sustainable advantages to strengthen their market position. BSC (Balanced Scorecard) is a systematically methodology considering non-financial indicators in assessing company's performance. In this way a hybrid approach was applied based on DEMATEL (Decision Making Trial and Evaluation Laboratory) and ANP (Analytical Network Process) under conditions of uncertainty [23].

2.2. Methods used in relocation problem

Which is the best location? This problem-solving approach starts with the data collection from the countries considered to have a real potential for relocation. If we consider their unpredictability and how sensitive they are to any event, we will reach a typical MCDM problem under conditions of uncertainty.

The evaluation and prioritization of feasible alternatives, depending on their preference, can be achieved by applying a model that is developing a decision-making problem using, fuzzy ARAS (Additive Ratio Assessment) and ANP approaches [15]. An overview of the international location decision, which includes a set of factors in the relocation process, was analysed throught the Delphi approach which provides a methodology for obtaining information from a group of individuals, who have relevant knowledge and experience. The results reflect opinions and views on location decisions [16]. Applying an ANP-TOPSIS analysis method, the five most impor-

tant indicators for the choice of location: diversity of transport services, availability of human resources, shipping services, distance to suppliers and markets, [17].

A decision-making instrument used to determine mission, objectives, strategy, direction and target market, to allocate resources, strategic planning is an essential component of tactics. According to definition, the process of choosing and establishing strategies constitutes strategic planning [18]. The lack of homogeneity of sub-urbanization processes, the efficient use of land, the lack of local practices and standards for the use of space and the shortcomings in its planning, are decision-makers when developing land plans, which consider economic and social policies [19].

MCDM methods should be integrated to adapt to multi criteria problems [20]. The development of plans, projects with other organizations and industries is another aspect of development. In this case, the internal process was identified as the most effective perspective, with a major influence on other aspects [21]. The authors developed a BSC model for universities with the help of two different groups of experts. According to the authors, one of the factors that has a major influence is the budget MCDM methods have extensive applications in solving decision-making problems [22]. An integrated model was applied based on TOPSIS, ANP, and SWOT analysis (strengths, weaknesses, opportunities, and threats). The results show that the production capacity should be improve [22–26]. Starting from the idea that different MDM (master data management methods) for the same problem offers mutually inconsistent solutions,a model was recommended to analyse the consistency of methods [23].

Identifying a suitable relocation alternative involves a complex case that requires that all criterion for making decisions be considered simultaneously. AHP (analytical hierarchy process) is a method for solving multi-criteria decision-making issues that is applied to numerous issues [27]. Selection problems involve the use of different qualitative and quantitative criteria. The adaptation of the Fuzzy-AHP model demonstrated actual organizational issues [28].

There are numerous MCDM techniques that assist decision makers in choosing the location. These include the analytical network process (ANP), the similarity of command preferences to ideal solution (TOPSIS), the weighted aggregate product valuation method (WASPAS), multicriteria optimization and compromise solution (VIKOR), analytical hierarchy

process (AHP), multi-attribute decisions and factors (FMAADM).

In the relocation process, the complex interactions between factors amplify the difficulty of the analysis. It was chosen to process the data using the SWOT-AHP method [9]. Decreased competitiveness and increased costs can be the consequences of a poorly chosen location and structured this complex problem using the AHP method. For this reason, the authors opted for a FUZZY-AHP extension, the advantage of this extension was the precision of the analysis, due to the reduction in the degree of inaccuracy [28].

In the case of the fuzzy CODAS (Combinative Distance-Based Assessment) technique, the evaluation process is based only on the ideal negative solution. The advantage of the method is that it involves two types of distance, which increase the results [29]. It was proposed the application of SWOT, FQSPM-Gap, (Fuzzy Quantitative Strategic Planning Matrix-Gap analysis), for the ranking of alternatives integrated with four methods: COPRAS-F, (Fuzzy Complex Proportional Assessment), Fuzzy MOORA, (Fuzzy Multi-objective Optimization by Ratio Analysis), ARAS-F, (Fuzzy Additive Ratio Assessment) and Fuzzy TOPSIS together with the Borda procedure [26] and analyzed the results obtained using MDM methods. The model provided reliable classification information for situations where the application of different MDM methods leads to mutually inconsistent solutions [23].

Popular and ideal for the application of the concept of business process management are micro, small; and medium businesses [30]. To make an action plan for the improvement of location selection, the availability of qualified human resources (HR) is one of the important factors [31]. The study introduced characteristics of factors of human resources. To find a suitable solution, a location assessment model is formed based on 34 indicators.

It was proposed a model developed within the AHP, which has a specific characteristic given by the set of evaluation criteria and the number of alternatives. The idea of α-cut was used in Buckley's optimization model to represent a certain amount of uncertainty in decision making [32] and used multi-criteria decision analysis (MCDA) to include multiple data, namely fractal size, slope, and flow accumulation [33]. The factors were integrated, and the determination of the weighting coefficients was made based on the AHP method. It was studied the urgent need for decommissioning the facilities due to unforeseen costs, significant danger, and environmental issues [20].

Finally, Table 1 presents a synthesis of the most relevant references and approaches that has been used for the proposed methodology of this study.

3. Methodology

Since the AHP method, frequently used by researchers, fails to capture the interdependencies and feedback between levels, the authors opted for the use of the analytical network process (ANP). The hybrid approach of ANP-TOPSIS captures the interdependencies and feedback between levels, leading to the location selection approach simultaneously consider environmental, economic, political and social policies [17]. Applying the TOPSIS method, the locations are ranked. The research model presented in Fig. 1 is structured in six stages: problem identification, factor selection, sub-factor selection, calculation of criteria weights with ANP method, evaluation of alternatives by applying the TOPSIS method and discussions on the ranking of alternatives. Some details of the adopted and applied methodology are presented in the following:

- Data were collected for each country and for 2017 – 2020 period. Next, ANP (Analytic network process) and TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), methods were applied to solve the problem of selecting the optimal variant of relocation. Throughout the work, the authors provide numerical results and graphic representations that support the proposed objectives. The data were collected from the Eurostat database for all the established criterion and sub-criterion for all selected countries and for a period of four consecutive years (2017, 2018, 2019 and 2020) [34]. A summary of the criteria to ensure homogeneity has been proposed. Most of them refer to the HR available in the countries considered in the analysis;
- Regional demographic statistics, related to the population structure data;
- Regional education statistics, gathers data on population participation in education and training, the structure of the population by level of education, dropout from education and training, on young people without employment and on employment rates of young people who do not follow the cycle of education and training;

Table 1
Synthesis of MCDM methods

Author (year)	Method	Method description approach
Saaty and Vargas, (2006)	ANP	Site selection
Nong, (2021)	ANP-TOPSIS	Selection of the distribution centre location
Zamani et al. (2014)	ARAS-F-ANP	Brand extension
Azimi et al. (2011)	SWOT-ANP-TOPSIS	The strategies prioritizing
Nazari-Shirkouhi et al. (2020)	BSC-FDEMATEL-FANP-IPA	Adopting more appropriate educational, research and institutional policies
Saaty (1987).	AHP	Site selection
Eslamipoor & Sepehriar, (2014)	SWOT-AHP	Firm relocation
Kaboli et al. (2007)	FAHP	The location problem
Pan, (2008)	FAHP	The selection of the suitable construction method.
Khazaeni et al. (2012)	FAHP	The selection of balanced risk allocation
Choudhury et al. (2019)	AHP-Gini coefficient method	Optimal location selection
Marinković et al. (2018)	DELPHI-AHP	Selecting location for a new business
Kabo-bah et al. (2021);	AHP-FD	Erosion potential mapping
Yu, (2002)	GP-AHP	Solving group decision-making problems
Abdelgawad and Fayek, (2010)	FFMEA-FAHP	Support for establishing timely corrective actions
Pamučar et al. (2017)	TOPSIS-COPRAS-VIKOR-ELECTRE	Site selection
Roy et al. (2019)	WIRN-COPRAS	The collective decision-making evaluation framework
MacCarthy & Atthirawong, (2003)	DELPHI	The international location decisions
Li and Hu, (2021)	AHP-SAW-SMARTS-MAUT	Facility decommissioning study

- Regional science and technology statistics, reflected data on HR in science and technology;
- Regional labour market statistics, gathers data about the active population, unemployment, population structure, long-term employees;
- Regional digital economy and society, collects data on households with internet access, people who have used the internet, frequency of use and activities, interaction with public authorities via the internet, people who have ordered goods or services via the internet;
- Regional environmental and energy statistics, collects data on greenhouse gas emissions and air pollutants;
- Regional poverty and social exclusion statistics, gathers information on people at risk of poverty or social exclusion, living in very low-intensity households, the rate of severe material deprivation and the rate of poverty risk;
- Regional transport statistics, cumulates information about the transported.

Location selection involves not only technical requirements but also economic, demographic,

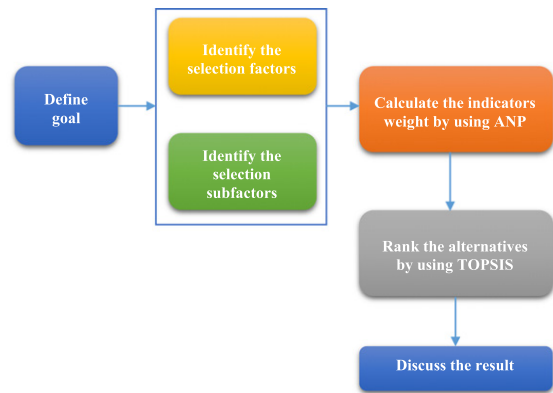

Fig. 1. The proposed research model.

social, environmental, infrastructure, education data solutions to such challenges often involve complex decision-making processes. The selected criteria reflect the dynamics and structure of the population and the educational level. The selected measurement indicators capture the evolution of these factors, (Table 2). Research and development data are in

Table 2
Criteria and sub criteria considered in the research approach

Criteria		Sub-criteria
Regional demographic statistics	C_1	Population structure indicators
Regional education statistics	C_2	Participation rate in education and training
	C_3	Population by educational attainment level
	C_4	Early leavers from education and training
	C_5	Young people neither in employment nor in education and training
	C_6	Employment rates of young people not in education and training
Regional science and technology statistics	C_7	R&D personnel and researchers
	C_8	GERD by sector of performance
	C_9	HRST by category and NUTS 2 regions
	C_{10}	Employed HRST by category, NACE Rev. 2 activity and NUTS 1 regions
Regional labour market statistics	C_{11}	Population by sex, age, citizenship, labour status and NUTS 2 regions
	C_{12}	Economically active population by sex, age and NUTS 2 regions (1 000)
	C_{13}	Economic activity rates by sex, age and NUTS 2 regions (%)
	C_{14}	Employment rates by sex, age, educational attainment level, citizenship and NUTS 2 regions
	C_{15}	Average number of usual weekly hours of work in main job by sex, age and NUTS 2 regions (hours)
	C_{16}	Unemployment rates by sex, age, educational attainment level and NUTS 2 regions (%)
	C_{17}	Long-term unemployment (12 months and more) by sex, age, educational attainment level and NUTS 2 regions (%)
	C_{18}	Labour market slack by sex, age and NUTS 2 regions
Regional digital economy and society	C_{19}	Households with access to the internet at home
	C_{20}	Households with broadband access
	C_{21}	Individuals who used the internet, frequency of use and activities
	C_{22}	Individuals who used the internet for interaction with public authorities
	C_{23}	Individuals who ordered goods or services over the internet for private use
Regional environmental and energy statistics	C_{24}	Cooling and heating degree days by NUTS 3 regions - annual data
Regional poverty and social exclusion statistics	C_{25}	People at risk of poverty or social exclusion by NUTS regions
	C_{26}	People living in households with very low work intensity by NUTS regions (population aged 0 to 59 years)
	C_{27}	Severe material deprivation rate by NUTS regions
	C_{28}	At-risk-of-poverty rate by NUTS regions
Regional transport statistics	C_{29}	Goods transported
	C_{30}	Summary of annual road freight transport by type of operation and type of transport
	C_{31}	National annual road transport by group of goods and type of transport
	C_{32}	International annual road freight transport - goods unloaded in reporting country, by group of goods and type of transport
	C_{33}	Country level - gross weight of goods handled in all ports
	C_{34}	Air transport of freight by NUTS 2 regions

line with the direction of collecting and reporting experimental research data. Another important aspect is given by the statistics of economy, connection, poverty, and social exclusion. Last, location selection cannot be done without infrastructure information. It can be seen from the list of criteria that most of them refer to the human resources available in the countries considered in the analysis.

The aim of the research is to anticipate barriers, the competitiveness of relocation motivations, although in this uncertain context the motivations are clearly defined (Table 2) and the selected states are: Belgium (A_1); Bulgaria (A_2); Czech Republic (A_3); Denmark (A_4); Germany (A_5); Estonia (A_6); Ireland (A_7); Greece (A_8); Spain (A_9); France (A_{10}); Croatia (A_{11}); Italy (A_{12}); Cyprus (A_{13}); Latvia (A_{14}); Lithuania (A_{15}); Luxembourg (A_{16}); Hungary (A_{17}); Malta (A_{18}); Netherlands (A_{19}); Austria (A_{20}); Poland (A_{21}); Portugal (A_{22}); Romania (A_{23}); Slovenia (A_{24}); Slovakia (A_{25}); Finland (A_{26}); Sweden (A_{27}); Iceland (A_{28}); Norway (A_{29}); Switzerland (A_{30}); Montenegro (A_{31}); North Macedonia (A_{32}); Serbia (A_{33}) and Turkey (A_{34}).

The integrated ANP-TOPSIS model could be useful to model MCDM problems under uncertainty conditions. The logical scheme of the analysis steps is shown in Fig. 2 and the calculation mathematical model will be presented below.

Local priorities are determined by calculating the geometric mean value of relative intensity:

$$\bar{a}_j = \sqrt[n]{a_{j1} \cdot a_{j1} \cdot \ldots \cdot a_{jn}} \tag{1}$$

where: aj - are the elements of the matrix that shows how many times the line criterion is more important than the column criterion; i - is the criteria index j = $\overline{1, \ n}$, ($n = 34$).

Further, **Appendix 1** presents the normalization of the result done by the normalization score (r_{ij}) calculations (for i = 1, ..., m; j = 1, ..., n):

$$\bar{x}_i = \frac{\bar{a}_j}{\sum_{j=1}^{n} \bar{a}_j} \tag{2}$$

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i}^{m} x_{ij}^2}} \tag{3}$$

The process continued with the configuration of the standardized weighted decision matrix.

$$\sum_{j=1}^{n} w_j = 1 \tag{4}$$

The next step is to determined the standardized decision matrix in function of corresponding weight; the new matrix is presented in **Appendix 2** and the
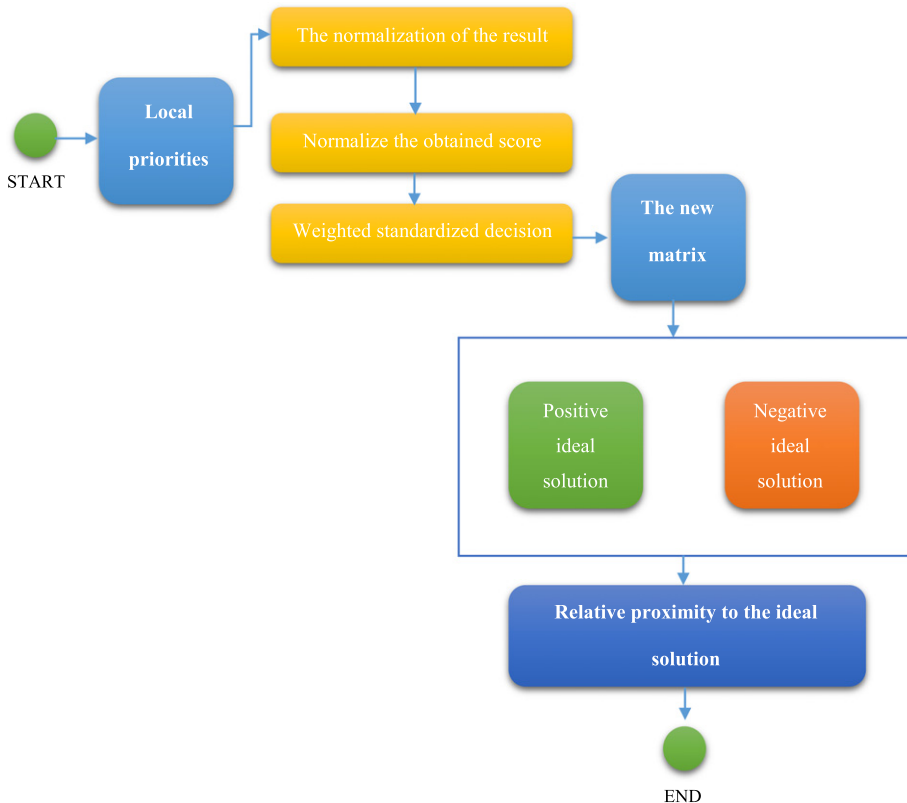

Fig. 2. The followed analysis steps (Logical scheme).

calculus is based on the following relation:

$$W'_{ij} = w_i r_{ij} \qquad (5)$$

Finally for establishing the hierarchy, the TOPSIS method was applied [35]:

- Positive ideal solution is considered with respect to the following relation:

$$A^+ = \{W_1'^+, \ldots, W_n'^+\}(\text{maxim valuses}) \qquad (6)$$

- Negative solution is determined based on the following relation:

$$A^- = \{W_1'^-, \ldots, W_n'^-\} \text{ (minimum values)} \qquad (7)$$

Each positive and negative ideal alternative were calculated separately and centralized in Table 3 following the mathematical relations (8) and (9).

$$S_i^+ = \sqrt{\sum_{j}^{n} = 1 \, (v_j^+ - v_{ij})^2}, \ i = 1, \ldots, m \qquad (8)$$

Table 3
Positive/negative solutions

Country	2017		2018		2019		2020	
	Si+	Si–	Si+	Si–	Si+	Si–	Si+	Si–
Belgium	0.257	0.041	0.255	0.045	0.250	0.046	0.253	0.040
Bulgaria	0.276	0.012	0.275	0.012	0.273	0.009	0.271	0.011
Czech Republic	0.242	0.052	0.239	0.055	0.233	0.056	0.238	0.050
Denmark	0.270	0.019	0.271	0.018	0.267	0.017	0.264	0.019
Germany	0.035	0.282	0.035	0.281	0.037	0.276	0.031	0.277
Estonia	0.285	0.006	0.284	0.007	0.279	0.006	0.279	0.004
Ireland	0.275	0.014	0.274	0.014	0.270	0.014	0.269	0.013
Greece	0.251	0.040	0.248	0.046	0.244	0.046	0.252	0.034
Spain	0.160	0.134	0.161	0.135	0.155	0.138	0.152	0.135
France	0.133	0.156	0.146	0.143	0.144	0.141	0.144	0.139
Croatia	0.282	0.006	0.281	0.006	0.276	0.007	0.275	0.007
Italy	0.200	0.097	0.198	0.099	0.191	0.102	0.190	0.101
Cyprus	0.285	0.015	0.280	0.027	0.275	0.027	0.278	0.014
Latvia	0.281	0.010	0.278	0.013	0.274	0.011	0.275	0.007
Lithuania	0.281	0.009	0.278	0.014	0.274	0.013	0.274	0.010
Luxembourg	0.279	0.034	0.278	0.033	0.273	0.034	0.274	0.033
Hungary	0.266	0.037	0.263	0.038	0.259	0.039	0.260	0.035
Malta	0.177	0.119	0.177	0.117	0.174	0.116	0.178	0.113
Netherlands	0.225	0.089	0.226	0.086	0.222	0.087	0.219	0.084
Austria	0.248	0.049	0.245	0.051	0.240	0.052	0.244	0.046
Poland	0.169	0.124	0.174	0.119	0.166	0.122	0.166	0.120
Portugal	0.273	0.017	0.273	0.016	0.269	0.015	0.269	0.014
Romania	0.269	0.019	0.267	0.021	0.261	0.023	0.260	0.022
Slovenia	0.281	0.007	0.280	0.007	0.276	0.007	0.275	0.007
Slovakia	0.268	0.038	0.266	0.037	0.261	0.038	0.264	0.034
Finland	0.261	0.028	0.260	0.027	0.257	0.027	0.257	0.026
Sweden	0.244	0.045	0.241	0.047	0.240	0.044	0.237	0.046
Iceland	0.177	0.119	0.177	0.116	0.173	0.115	0.170	0.116
Norway	0.261	0.033	0.260	0.032	0.257	0.032	0.256	0.032
Switzerland	0.256	0.043	0.253	0.047	0.250	0.044	0.244	0.050
Montenegro	0.288	0.001	0.287	0.002	0.283	0.008	0.277	0.028
North Macedonia	0.171	0.121	0.176	0.118	0.173	0.118	0.165	0.118
Serbia	0.165	0.124	0.168	0.121	0.164	0.120	0.169	0.117
Turkey	0.163	0.000	0.171	0.124	0.167	0.125	0.160	0.128

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_j^- - v_{ij})^2}, \ i = 1, \ldots, m \quad (9)$$

The relative proximity to the ideal solution could be determine based on (10):

$$C_i^+ = \frac{S_i^-}{S_i^+ + S_i^-}, \ 0 < C_i^+ < 1 \quad (10)$$

4. Results and discussion

4.1.. Research results

If before the COVID-19 pandemic, relocation had a negative connotation in developed countries, now the perception is different. The relocation direction is from Eastern to Western Europe, as this research demonstrates. The study captures existing trends in the relocation issue generated by the COVID-19 pandemic. The multi-criteria model provides reliable results to obtain rational decisions and eliminates rank inversion problems [36]. The synthesis of the causes that determine the relocation, of the indicators and methods used contributes to the literature completion. The results obtained with ANP method illustrated the structure of the model and the interdependence of the criteria (Fig. 3). In the first stage the results were normalized (**Appendix 1**) and the decision matrix was identified (**Appendix 2**).

The infrastructure modernization contributes to the change of location selection and, to the stimulation of long-term economic growth. By creating jobs,

infrastructure projects help reduce poverty while also improving the quality of life of locals. Infrastructure contributes to the movement of people and goods and influences companies' revenues, policies, and strategies [37]. It is noted that the infrastructure had the largest share in three of the periods analysed (2017, 2018 and 2020). In 2019, the infrastructure was overtaken by two other criteria (research and development and the labour market).

The next step was to create the super-matrix that led to the criteria weighting (**Appendix 3**).

This analysis shows that integrated ANP-TOPSIS model have been applied to evaluate and prioritize relocation strategies in Europe. It was decided to apply the ANP due to the possible dependencies between criteria, indicators, and alternatives. Calculations' results, the relative proximity of the ideal solution (C_i + related to(10)), are presented in Table 4 (calculation separated from the positive ideal point S_i + based on (8) and the negative point S_i + based on (9)).

These results have given the countries ranking (Fig. 4) and the dynamics of the hierarchy in the analyzed period as presented in **Appendix 4** and **Appendix 5** which shows the dynamics of the score for each country considered in the research. The main results are:

- Germany is the best solution for relocation in all periods analyzed, followed by France with a difference of 0.384, Spain with 0.426 and Turkey with 0.454. Therefore, Germany is the best choice for business location due to its

Fig. 3. The conceptual model of the research.

Table 4
Relative proximity to the ideal solution (Ci+)

Country	2017	2018	2019	2020
Belgium	0.138	0.151	0.156	0.136
Bulgaria	0.044	0.041	0.034	0.039
Czech Republic	0.177	0.186	0.194	0.173
Denmark	0.067	0.061	0.061	0.066
Germany	0.888	0.888	0.882	0.896
Estonia	0.020	0.023	0.021	0.017
Ireland	0.049	0.047	0.049	0.047
Greece	0.137	0.157	0.158	0.120
Spain	0.457	0.455	0.470	0.469
France	0.539	0.494	0.495	0.490
Croatia	0.022	0.023	0.025	0.025
Italy	0.327	0.332	0.348	0.347
Cyprus	0.049	0.088	0.090	0.047
Latvia	0.034	0.044	0.041	0.028
Lithuania	0.033	0.046	0.047	0.037
Luxembourg	0.110	0.106	0.110	0.110
Hungary	0.123	0.128	0.131	0.120
Malta	0.402	0.398	0.401	0.389
Netherlands	0.283	0.276	0.283	0.277
Austria	0.165	0.174	0.178	0.159
Poland	0.424	0.405	0.424	0.420
Portugal	0.059	0.055	0.055	0.052
Romania	0.068	0.075	0.081	0.079
Slovenia	0.025	0.026	0.027	0.025
Slovakia	0.124	0.123	0.127	0.114
Finland	0.097	0.096	0.095	0.092
Sweden	0.158	0.164	0.155	0.163
Iceland	0.401	0.397	0.400	0.406
Norway	0.114	0.112	0.110	0.113
Switzerland	0.146	0.156	0.151	0.171
Montenegro	0.004	0.005	0.029	0.092
North Macedonia	0.416	0.401	0.404	0.417
Serbia	0.429	0.418	0.423	0.410
Turkey	0.445	0.419	0.428	0.444

modern infrastructure and the stability of its political and economic environment. Eastern Europe has been a favourite area of large companies for the past two decades for relocating facilities [7, 38, 39]. Eastern European countries, with some exceptions, record a decrease in the score, especially after the Covid-19 pandemic;

- Poland, Hungary and Austria have been one of the most attractive countries for companies in the last two decades. However, there is a reduction in the score after 2019;

- The Czech Republic and Slovakia were two favourite destinations for Western European companies. In the case of the Czech Republic, there is a reduction in the score after 2019, while Slovakia registered a sharp decrease in the rating throughout the period;
- In Romania the results show a capping of the score after 2019;
- Bulgaria registered a decrease in the score for the entire analysed period. A similar trend is manifested in Greece, Cyprus, Malta and Serbia especially after 2019;

- In the case of Slovenia, a turning point in 2019 can be identified, materialized by the consistent decrease of the score;
- The Baltic countries have had an approximately similar evolution. If in the case of Estonia and Latvia there is a decrease in the score after 2018, in Lithuania the trend is to cap;
- There are several countries that have had an increase score, such as Croatia, Northern Macedonia and Montenegro;
- Germany, Switzerland, Spain and Italy are characterized by a considerable increase in the score. A similar dynamic, but with a lower growth rate we meet in Iceland;
- Norway, the Netherlands, Belgium had an oscillating evolution but with growth trends after 2019;
- We find a distinct situation in Turkey. Although there was a sharp decrease in the score in 2018 and 2019, there is an increase in 2020. The increase in score can be justified by the geostrategic position that this country has.

Appendix 4 emphasizes the dynamics of the hierarchy over the studied time periods; **Appendix 5** highlights the dynamics of the score and the trend for each country considered in this study.

The criteria and sub-criteria considered in the analysis and their dynamics in the analyzed period were presented by the authors. Such a phenomenon will cause considerable changes in the HR market, related to the geographical areas of the material and financial flows, too.

4.2. The research implications

The consequence of this study in the relocation-specific literature is significant. Given that relocation involves financial resources, the choice of location determines the long-term capital savings. Existing trends in national markets have a major role in substantiating the relocation decision. The financial balance of many companies after the COVID-19 pandemic is precarious. Since they cannot afford to skid, the study contributes to their better information. The study results contribute to the success of companies that relocate their business. The results obtained confirm other studies outcomes and implications, demonstrating back-shoring phenomenon imposed by the Industry 4.0 revolution [40–42]. Based on these we can say that military events in Ukraine will amplify these existing trends in the relocation of companies.

4.2. Limitations

There are some limitations of the study determined by the field studied, the availability of the data collected, and the methods used. Studies may be limited to a single industry; this may be more significant than the criteria used to choose the place [24]. An optimized strategic alliance can only take place with the agreement of all parties [26].

One limitation of the analyzed methods is the interdependence of the criteria. The study opted for a wide range of locations, and the ANP-TOPSIS anal-
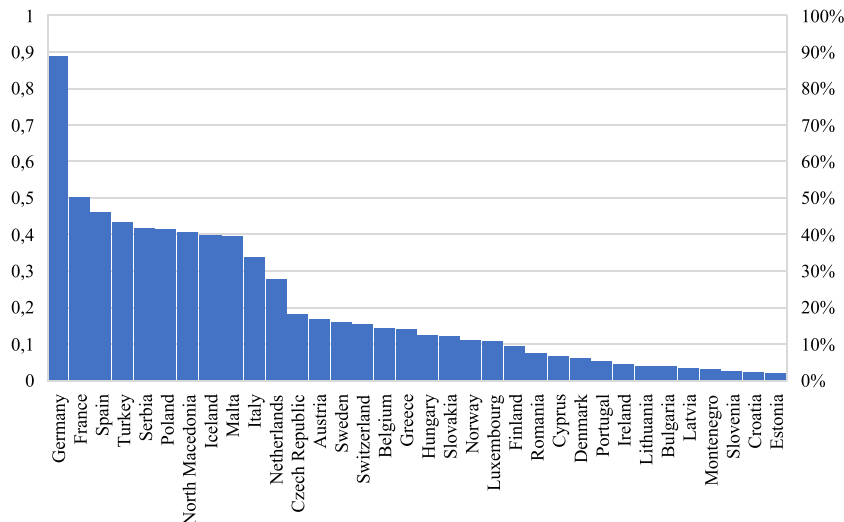

Fig. 4. The Rank of the considered countries in the research.

ysis reduced the interdependence of the criteria. The share of indicators depends not only on the economic context but also on the object of activity of the organizations. Secondly, it is based on the area of the European space. Restricting it could lead to different results, which requires further development. A significant limitation of the results' study is given if the different legal system (specific laws and regulations at the national level) in the European Union member states is considered.

These limitations may be removed in future research and may lead to an understanding of the links between uncertainty and business results. Future studies could investigated how government affects relocation, the security provided by the country in which the company will relocate, the cost savings identified, and finally the COVID-19 epidemic, which caused damage to the global economy, led to the discovery of additional elements.

5. Conclusions

Choosing an optimal location is a research concern, not only to identify a location that will give organizations the opportunity to reduce their costs, to be close to the raw materials or market, to be able to hire qualified human resources, but to prevent the risks associated with relocation. The current context is characterized by instability and insecurity. If the COVID-19 pandemic led to the reduction of companies' activity, some industrial sectors were more affected than others, depending on the field in which they carried out their activity. Today's reality calls for a risk-focused approach. Minimizing the risks of relocation has been an important criterion in research, as it is done with considerable financial effort.

The investigation of location selection as a step in organizational growth includes methods, resources, and mechanisms. The study findings indicate that infrastructure and human resources are key factors in the selection of sites. An essential part of economic operations is the choice of qualified individuals. It is important to remember that human resources play a crucial role in the efficient functioning of any company. Locations with a lower risk become preferred, even if they do not bring cost savings. Another crucial aspect is to keep the company's assets safe, without exposing them to the risk. After the pandemic, the risk of relocation is a major concern for companies. In this paper, we argue a point of view on this process, offering a combined multi-criteria decision-making (MCDM) approach to evaluate the European

countries that offer the most favorable resettlement conditions by interrogating a large database and type of criteria and indicator.

The methodology outlined in the study is based on assessing places with the aid of chosen indicators. Selection is based on the positional classification approach, and the rank of places is determined using the MCDM model. The suggested method enables us to choose a location that meets the specified criteria and has pertinent characteristics. Future research will look at how the hybrid MCDM method is applied for site selection, considering the significance of the criteria and recent developments in Europe.

The performance of the company depends greatly on the evaluation of location choice. The MCDM approach of location evaluation is more rational, practical, objective, and impartial. This approach suggested a new way of thinking to assess the site using HR indicators, which might boost the value of the business. The HR value in the Knowledge Economy Era is undeniable. As a result, it is crucial to consider both the economic state of development and the role HR are playing in this context. Managers now have a simple, scientific, and logical technique thanks to the ANP-TOPSIS. Countries were ranked and the criteria were evaluated using an integrated ANP-TOPSIS model. From the results of the analysis, it can be seen that "infrastructure" is the criterion that can help reduce risks, costs and economic development. The research results reinforce the importance of infrastructure in substantiating the relocation decision. The strategic positioning of the company, the expansion, or following the current context, the restriction of the geographical area are essential aspects in relocating a business.

Future research can be an important support for managers in terms of the risk of relocation decisions, in selecting the most appropriate strategy in function of the economic context and the specifics of organizations and finally for an assessment of future returns. Data collection can lead to inconclusive results depending on the database used and their timeliness.

Author contributions

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Supplementary material

The Appendix is available in the electronic version of this article: https://dx.doi.org/10.3233/HSM-220062.

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