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EVALUATION OF CUSTOMS, INFRASTRUCTURE AND LOGISTICS SERVICES WITH MULTI-CRITERIA DECISION-MAKING METHODS: A COMPARATIVE ANALYSIS FOR THE TOP 10 COUNTRIES IN THE LOGISTICS PERFORMANCE INDEX

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ABSTRACT

Purpose- The aim of this study is to examine the performance of customs, infrastructure and logistics services of the countries ranked in the top 10 in the Logistics Performance Index (LPI) ranking in 2023 with Multi-Criteria Decision Making Methods (MCDM) and to rank and compare them. The World Bank's LPI criteria and weights were taken into consideration while determining the criteria considered within the scope of the study.

Methodology- When employing the MCDM methods, various elements are taken into account during the decision-making process, and options are graded in accordance with these criteria. By taking into account the importance of many criteria and the performance of alternatives, MCDM techniques provide researchers with an organized and objective method for making difficult judgments. In this study Topsis and Edas methods, which are among the MCDM methods, were used to rank the countries.

Findings- When the results of the analysis are summarized, it is observed that the first three ranks differ from the results of the LPI report. According to the Topsis method, Finland ranks first, Singapore ranks second and Austria ranks third. According to the Edas method, Singapore and Finland ranked in the first two places as in the LPI 2023 report, while Switzerland ranked third. The findings of the study show that the rankings may be different even when the criteria and criteria weights used within the scope of the analysis are the same in MCDM methods.

Conclusion- The findings demonstrate that, even though the criteria and weights employed within the parameters of the study are the same, the rankings in MCDM approaches may differ. This is due to the possibility of various computation strategies or theoretical underpinnings for the procedures being used. The results of this study can therefore be applied to assist decision-makers in this field and improve a country's logistics performance. By illustrating the utility of MCDM techniques in making such decisions, it also makes an important contribution to ongoing research in this field.

Keywords: Logistics performance, LPI, Multi-Criteria Decision Making, MCDM, Edas, Topsis.
JEL Codes: D61, D91, L91.

1. INTRODUCTION

Transportation infrastructure and logistics systems are essential in order for countries and businesses to acquire services in areas including international transport, storage, packing, labeling, and customs clearance (Bayraktutan and Özbilgin, 2015: 96). The foundation of the world economy and a crucial element in all economic activity is infrastructure (Yingfei et al., 2022: 4). Among the most significant determinants of global competitiveness are geographic variables and the availability of transportation infrastructure. In this respect, it is widely acknowledged that geographic distance between an area and its major trading partners and logistics, which are essential to facilitating trade, are elements that explain a region's competitiveness in global markets (Bensassi et al., 2015: 47. Logistics is described as the effective and efficient planning, implementation, and control of the movement and storage of goods and services from their origin to their destination in order to satisfy consumer expectations. According to Khan et al. (2019), logistics affect a company's performance. To meet customer needs, logistics, a part of supply chain management, is in charge of planning and storing goods, services, and data from the point of production to the point of consumption.

Effective logistics services are crucial for businesses to remain competitive, especially in global markets, and are required to meet the objective of providing mass-customized, high-quality products in a sustainable way (Winkelhaus and Grosse, 2020: 3). This services are now crucial to the success of businesses. Businesses now routinely evaluate, improve, and reengineer their logistics operations as a result of customers' needs for specialized goods and services and the environment's intense competition (Gotzamani, 2010: 439). Therefore, efficient logistics services provide cost savings in processes such as transportation, warehousing and inventory management, allowing products to be offered at more competitive prices and increasing profit margins.

As competition has intensified, performance measurement has become more important. Performance results, which are the measure of success, are recognized as the differentiating power of competition between countries. These results allow countries to determine plans and strategies by seeing their own situation among the countries of the world. Therefore, these performance reports published by international organizations are important for countries (Bozkurt and Mermertaş, 2019: 108). A nation's competitiveness and welfare are significantly influenced by its logistics performance. It emphasizes the significance of regional or national logistics assessment because it is essential for understanding trade flows (Banister and Berechman, 2001; Bensassi et al., 2015). The efficacy and efficiency with which logistics activities are carried out were characterized by Mentzer and Konrad (1991) as logistics performance. The relevance of difference is emphasized by Langley and Holcomb (1992), who broaden this definition and point out that the value that customers receive from logistics operations serves as a gauge of those activities' effectiveness. The authors contend that through efficiency, efficacy, and differentiation, logistics may add value. Customer service components including product availability, promptness and consistency of delivery, and convenience of ordering enable differentiation and value generation. The performance of logistics, however, is crucial to a nation's industrial and economic development (Moldabekova et al., 2021: 207). Services in logistics bring various sectors of an economy together and link the local economy to the international economy. By generating jobs, additional money, and opening up the door for foreign investment, the logistics sector also significantly boosts the national economy. Given that all sectors are now more dependent on the logistics sector, it is also crucial for boosting the competitiveness of enterprises and industries (Tang and Abosedra, 2019: 1).

Information regarding a nation's logistical performance and capabilities in the export and import procedures is necessary for foreign trade stakeholders. Numerous institutions and groups are working to assess each nation's logistics performance in order to address this need (Kara, 2022: 79). In order to assess and analyze the logistical performance of 150 countries, the World Bank first developed the Logistics Performance Index (LPI) in 2007. A country can identify the benefits and drawbacks of its partners and logistics system using this index and make suggestions for improvements (Rezaei et al. 2018; 165; Sergi et al. 2021: 2). The LPI is an interactive measurement tool designed to help nations find opportunities and barriers in their trade logistics performance as well as methods to improve it. LPI is a measure used to evaluate the effectiveness of a country's logistics sector. There are six main criteria under this index. These criteria are customs, infrastructure, logistics service quality, international transportation costs, traceability and tracking ability, and on-time delivery (World Bank, 2023). The LPI is based on polls of logistics experts, whose opinions have a direct impact on how businesses decide where to produce their goods, which suppliers to use, and which markets to target. Despite its limitations, it has developed into a key performance indicator in the transportation and logistics sector and is extensively used in research on trade logistics (Song and Lee, 2022: 2). These standards assess a nation's ability to compete in global trade by analyzing the elements that facilitate trade and enable logistical operations. A country can become more competitive in international trade and contribute more effectively to global supply chains by having good logistics performance.

Efficient management of customs, infrastructure and logistics services promotes trade facilitation and international co-operation by enabling faster and smoother movement of goods and services across borders. It is clear from a review of the literature that numerous studies have examined the logistics performance of nations using various methodologies and in various temporal and geographic contexts (Çakır and Perçin, 2013; Özceylan et al., 2016; Rezaei, et al., 2018; Oğuz, et al., 2019; Ulutaş and Karaköy, 2019; Chejarla et al., 2022; Türkoğlu and Duran, 2023). This study's objective is to rank and compare the top 10 nations according to their MCDM analyses of their 2023 LPI rankings. The World Bank's LPI criteria and criteria weights were taken into account when calculations using the Edas and Topsis procedures were produced in this situation. This work is important because it provides a scientific basis for the effective implementation of MCDM techniques when making crucial decisions to improve the logistical performance of many countries so they may successfully participate in international trade. The study provides an objective technique for judging the logistical performance of particular countries based on the LPE criteria and weights employed by the World Bank. The computations were performed using the 2010 version of Microsoft Excel.

This study intends to make an academic contribution by highlighting the significance of the logistics industry and by examining and contrasting the successes of nations with high levels of performance in this area.

2. METHODOLOGY

Different units of measurement, quality characteristics, and relative weights may apply to various criteria. It's feasible that some criteria can be quantified, while others can only be subjectively defined. Operations research's MCDM, expressly takes into account numerous criteria in decision-making situations. Making sound decision-making decisions requires carefully structuring complex problems and explicitly taking into account many criteria (Zavadskas et al., 2016: 646). Multiple factors are considered in decision-making processes when using the MCDM technique, and options are rated in accordance with these criteria. When making complicated decisions, MCDM approaches give researchers an objective and organized decision-making process by taking into consideration the significance of various criteria and the performance of alternatives (Ulutaş, 2018; Dhurkari, 2022). In this investigation, Topsis and Edas procedures were used. The calculations for each of the study's methods are broken down in this section.

2.1. Topsis Method

Hwang and Yoon developed the MCDM technique named TOPSIS (technology for order preference by similarity to an ideal solution) in 1980.This method is a useful approach for dealing with MCDM issues. However, it is vital that the weights, ideal/anti-ideal solutions, and the criteria are accurately normalized and defined.The positive and negative ideal solutions are fundamental components of this approach. The Topsis method entails the following application steps (Jahanshahloo et al., 2006; Ren et al., 2007; Zavadskas et al., 2016; Özbek, 2017; Zulqarnain et al., 2020).

Stage 1. Calculation of the normalized decision matrix: Firstly, the criteria values are normalised by dividing them by the square root of the sum of squares of the criteria, as demonstrated in the equation provided below.

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}}$$

j=1, . . . , m, i=1 . . .,n.

The standard decision matrix (R_{ij}) is generated after normalizing the decision matrix using the above equation.

$$\boldsymbol{R}_{ij} = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

Stage 2. Weighting the normalized decision matrix: In this phase, the standard decision matrix with weights (V_{ij}) is calculated by multiplying the pre-determined criterion weights (w_j) with the elements of Rij given in the equation mentioned above.

$$V_{ij} = \begin{bmatrix} w_1 n_{11} & w_2 n_{12} & \dots & w_n n_{1n} \\ w_1 n_{21} & w_2 n_{22} & \dots & w_n n_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ w_1 n_{m1} & w_2 n_{m2} & \dots & w_n n_{mn} \end{bmatrix}$$

Stage 3. Obtain the positive and negative ideal solutions: The weighted and normalized matrix's highest performance values are represented by the positive ideal solution point (A^{+}), while its worst performance values are represented by the negative ideal reference point (A^{-}).

$$A^{*}=\left\{(\max_{i} v_{ij}\middle| j\in J),(\min_{i} v_{ij}\middle| j\in J^{'}\right\}$$

$$A^{-}=\left\{(\min_{i} v_{ij}\middle| j\in J),(\max_{i} v_{ij}\middle| j\in J^{'}\right\}$$

Stage 4. Separation distance from positive and negative ideal solution of each alternative: The Topsis approach uses two methods of separation. First, the Euclidean distances of the alternatives to the positive ideal solution points are computed (S_i^*), followed by the distances to the negative ideal solution points (S_i^-).

$$S_i^* = \sqrt{\sum_{j=1}^{n}(v_{ij}-v_j^*)^2}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij}-v_j^-)^2}$$

Stage 5. Relative closeness to the ideal solution: C_i^* is the proximity coefficient and the following equation can be used to determine how close the alternatives are to the optimum solution point in the positive direction.Then, the performance rankings of the alternatives are arranged according to the order of magnitude of their C_i^* values. The option with the highest value is prioritized.

2.2. Edas Method

The Edas technique, developed in 2015 by Keshavarz Ghorabaee et al. relies evaluation on separation from the mean solution. The two distance measures that form the basis of the Edas approach are the Positive Distance from Average (PDA) and the Negative Distance from Average (NDA). To evaluate alternatives, higher PDA and lower NDA values are employed, correspondingly (Stanujkic et al., 2017: 7). With this approach, the effectiveness of the alternatives is assessed and graded. Many multi-attribute decision-making issues that presuppose decision-making under absolute rationality are solved using this approach. This method gives flexibility in calculating criterion weights and ideal/anti-ideal solutions, making it a viable tool for dealing with MCDM situations. It is crucial to properly normalize the criteria and give weights in order to get reliable results. The Edas method consists of the following steps (Keshavarz Ghorabaee et al., 2015; Karabasevic et al., 2018; Ulutaş, 2018; Asante et al., 2020; Li et al., 2020; Huang et al., 2021; Lei et al., 2022).

Stage 1. Creating the decision matrix: The decision matrix for the choice problem is constructed in the first step of the use of the Edas technique.

Stage 2. Determining the average solution according to all criteria: In this step, the average solutions matrix (AV_j) is created by computing the average scores of the criteria.

$$AV_j = \frac{\sum_{i=1}^{n} X_{iJ}}{n}$$

Stage 3. Calculating PDA and NDA matrices based on the type of criterion (cost and benefit): Different equations are used to generate positive (PDA) and negative (NDA) distance from the mean matrices for each element (PDA_{ij}, NDA_{ij}), depending on whether a criterion is cost-based or benefit-based. In this situation, NDA denotes the alternative's negative distance from the average solution and PDA denotes the alternative's positive distance from the average solution.

$$PDA = [PDA_{ij}]_{nxm},$$

$$NDA = [NDA_{ij}]_{nxm}$$

The cost criterion indicates the criteria that should be minimized, whilst the benefit criterion indicates the criteria that should be maximized.

For cost-based criteria,

$$PDA_{ij}=\frac{\max(0,(AVj-Xij))}{AVj}$$

$$NDA_{ij}=\frac{\max(0,(Xij-AVj))}{AVj}$$

For benefit-based criteria,

$$PDA_{ij}=\frac{\max(0,(Xij-AVj))}{AVj}$$

$$NDA_{ij}=\frac{\max(0,(AVj-Xij))}{AVj}$$

Stage 4. Determining the weighted sum of PDA and NDA for all altematives: In this stage, the positive and negative distance matrices from the mean are used to calculate weighted total positive (SP_i) and negative (SN_i) values.

$$SP_i = \sum_{j=1}^{m} w_j \, xPDA_{ij}$$

$$SN_i = \sum_{j=1}^{m} w_j \, xNDA_{ij}$$

Stage 5. Normalization of weighted total values: In this stage, the SPi and SN_i values are computed for all criteria by employing the subsequent formula.

$$NSP_i = \frac{SP\dot{I}_i}{\max_i(SPi)}$$

$$NSN_i = 1 - \frac{SN_i}{\max_i(SN_i)}$$

Stage 6. Calculating the appraisal score (AS_i) for all alternatives: Finally, the evaluation scores (AS_i) for each alternative are calculated.

$$AS_i=\frac{1}{2}(NSP_i+NSN_i)$$

The alternatives' evaluation scores (AS_i) are then rated from high to low. The option with the highest value is chosen as the best option out of all the other options.

3. EMPIRICAL RESULTS

The study assessed and ranked the performance of the countries based on the six LPI criteria determined by the World Bank. Table 1 and Table 2 present the countries and criteria examined in the analysis, respectively.

Table 1: Countries Assessed in the Scope of Analysis

Country Code	Country Name
P1	Singapore
P2	Finland
P3	Denmark
P4	Germany
P5	Netherlands
P6	Switzerland
P7	Austria

P8	Belgium
P9	Canada
P10	Hong Kong

Table 2: Criteria Used within the Scope of the Analysis

Criterion Code	Criterion Name
C1	Customs
C2	Infrastructure
C3	International Shipment
C4	Quality and Competence in Logistics
C5	Traceability and Tracking
C6	On Time Delivery

Firstly, Topsis method calculations and ranking were made Table 3 shows the decision matrix with the 2023 performance scores of the top 10 countries in the LPI ranking.

Table 3: Decision Matrix

Countries	C1	C2	C3	C4	C5	C6
P1	4.2	4.6	4.0	4.4	4.3	4.4
P2	4	4.2	4.1	4.2	4.3	4.2
P3	4.1	4.1	3.6	4.1	4.1	4.3
P4	3.9	4.3	3.7	4.2	4.1	4.2
P5	3.9	4.2	3.7	4.2	4	4.2
P6	4.1	4.4	3.6	4.3	4.2	4.2
P7	3.7	3.9	3.8	4.0	4.3	4.2
P8	3.9	4.1	3.8	4.2	4.2	4.0
P9	4.0	4.3	3.6	4.2	4.1	4.1
P10	3.8	4.0	4.0	4.0	4.1	4.2

Criterion weights in the calculations made while evaluating the countries were realized by taking into account the component weights used in the LPI calculations. The normalized scores of each of the six original indicators are multiplied by their components to form the international LPI score, and the component loadings correspond to the weights assigned to each original indicator (Arvis et al., 2023). The criteria weights utilised in the investigation are outlined in Table 4.

Table 4: Criteria and Weights

C1	C2	C3	C4	C5	C6
0.4105	0.4133	0.3931	0.4168	0.4133	0.4021

When Table 4 is examined, it is seen that the most important criterion according to the weights of the criteria used in LPI calculations is C4, quality and competence in logistics. These weights were transferred to Topsis and Edas methods and ranking was made. The calculation tables and ranking results are shown below respectively. First of all, the normalized decision matrix obtained by normalizing the decision matrix created to apply the Topsis method is shown in Table 5.

Table 5: Normalized Decision Matrix

Countries	C1	C2	C3	C4	C5	C6
P1	0.3979836	0.409297	0.398905	0.395803	0.388144	0.391905
P2	0.379032	0.373706	0.408877	0.377812	0.388144	0.374092

P3	0.3885078	0.364809	0.359014	0.368816	0.370091	0.382998
P4	0.3695562	0.382604	0.368987	0.377812	0.370091	0.374092
P5	0.3695562	0.373706	0.368987	0.377812	0.361064	0.374092
P6	0.3885078	0.391502	0.359014	0.386807	0.379118	0.374092
P7	0.3506046	0.347013	0.378959	0.35982	0.388144	0.374092
P8	0.3695562	0.364809	0.378959	0.377812	0.379118	0.356278
P9	0.379032	0.382604	0.359014	0.377812	0.370091	0.365185
P10	0.3600804	0.355911	0.398905	0.35982	0.370091	0.374092

The weights (w_j) are used to multiply the normalized values from Table 5, resulting in a weighted normalized matrix as shown in Table 6. Then the greatest A+ and smallest A- values in each column of the weighted normalized matrix were chosen to determine the positive and negative ideal solution values. The values are shown in Table 7.

Table 6: Weighted Normalized Matrix

Countries	C1	C2	C3	C4	C5	C6
P1	0.0663525	0.068512	0.066795	0.065809	0.064469	0.065089
P2	0.0631929	0.062555	0.068465	0.062817	0.064469	0.06213
P3	0.0647727	0.061065	0.060115	0.061322	0.06147	0.063609
P4	0.0616131	0.064044	0.061785	0.062817	0.06147	0.06213
P5	0.0616131	0.062555	0.061785	0.062817	0.059971	0.06213
P6	0.0647727	0.065533	0.060115	0.064313	0.062969	0.06213
P7	0.0584534	0.058086	0.063455	0.059826	0.064469	0.06213
P8	0.0616131	0.061065	0.063455	0.062817	0.062969	0.059171
P9	0.0631929	0.064044	0.060115	0.062817	0.06147	0.060651
P10	0.0600332	0.059576	0.066795	0.059826	0.06147	0.06213

Table 7: Positive and Negative Ideal Solution Values

	C1	C2	C3	C4	C5	C6
A+	0.0663525	0.068512	0.068465	0.065809	0.064469	0.065089
A-	0.0584534	0.058086	0.060115	0.059826	0.059971	0.059171

Then, the distance S_i^* of the alternatives from the positive ideal solution, the distance S_i^- of the alternatives from the negative ideal solution and the C_i^* value indicating the proximity of the alternatives to the positive ideal solution point are calculated. The performances of the alternatives, i.e. the countries, are ranked according to the magnitudes of the C_i^* values. The performance rankings are as shown in Table 8.

Table 8: Topsis Ranking Results

Countries	S_i^*	S_i^-	C_i^*	Ranking
P1	0.001669871	0.017514	0.912954724	2
P2	0.012250315	0.156704	0.927493368	1
P3	0.123749539	0.152064	0.551328467	4
P4	0.125203085	0.152643	0.549379913	6

P5	0.124444984	0.151424	0.548898614	7
P6	0.127496834	0.15513	0.548886751	8
P7	0.120052377	0.149709	0.554968662	3
P8	0.124545454	0.151539	0.548886421	9
P9	0.125174834	0.152026	0.54843272	10
P10	0.123322951	0.151105	0.550617794	5

When Table 8 is evaluated, Finland (P2), Singapore (P1), and Austria (P7) are clearly in the top three positions based on the results of Topsis.Then the Edas method computations were done after the Topsis method ranking. The first stage in the Edas technique is to calculate the average solutions to the criterion. Table 9 displays the average solution value for each criterion. Then, the computation of the positive distance from the mean matrix (PDA) and the negative distance from the mean matrix (NDA). Tables 10 and 11 show these matrices, respectively.

Table 9: Average Solutions of the Criteria

C1	C2	C3	C4	C5	C6
3.96	4.21	3.79	4.18	4.17	4.2

Table 10: Positive Distance Matrix from the Mean

	C1	C2	C3	C4	C5	C6
P1	0.02487879	0.0382867	0.02178127	0.02193684	0.012885	0.019147619
P2	0.00414646	0	0.0321533	0.00199426	0.012885	0
P3	0.01451263	0	0	0	0	0.00957381
P4	0	0.00883539	0	0.00199426	0	0
P5	0	0	0	0.00199426	0	0
P6	0.01451263	0.01865249	0	0.01196555	0.002973	0
P7	0	0	0.0010372	0	0.012885	0
P8	0	0	0.0010372	0.00199426	0.002973	0
P9	0.00414646	0.00883539	0	0.00199426	0	0
P10	0	0	0.02178127	0	0	0

Table 11: Negative Distance Matrix from the Mean

	C1	C2	C3	C4	C5	C6
P1	0	0	0	0	0	0
P2	0	0.00098171	0	0	0	0.00085032
P3	0	0.01079881	0.01970686	0.00797703	0.006938	0
P4	0	0	0.00933483	0.00699664	0.006938	0.00085032
P5	0.0062197	0.00098171	0.00933483	0	0.016849	0.00085032
P6	0	0	0.01970686	0	0	0.00085032
P7	0.02695202	0.03043302	0	0.01794833	0	0.00085032
P8	0.0062197	0.01079881	0	0	0	0.00085032
P9	0	0	0.01970686	0	0.006938	0.00957381
P10	0.01658586	0.02061591	0	0.01794833	0.006938	0.00085032

Finally, in the Edas method, the evaluation scores (AS_i) of each alternative were calculated and the countries were ranked. The ranking results are as shown in Table 12.

Table 12: Edas Ranking Results

Countries	SP_i	SN_i	NSP_i	NSN_i	AS_i	Ranking
P1	0.138915866	0	1	1	1	1
P2	0.051178673	0.00098171	0.36841489	0.98696845	0.677691671	2
P3	0.024086436	0.0454206	0.17338866	0.39707197	0.285230314	7
P4	0.01082965	0.00933483	0.07795834	0.87608639	0.477022367	4
P5	0.001994258	0.0333854	0.01435587	0.55683119	0.285593532	6
P6	0.048104052	0.01970686	0.34628191	0.73840461	0.542343262	3
P7	0.013921855	0.07533336	0.10021789	0	0.050108947	10
P8	0.006004843	0.03616613	0.04322647	0.51991883	0.281572653	8
P9	0.014976115	0.03621856	0.10780709	0.51922285	0.313514967	5
P10	0.021781266	0.06208799	0.15679466	0.17582348	0.166309073	9

When the Edas ranking results in Table 12 are analyzed, it is seen that the top three countries are Singapore (P1), Finland (P2) and Switzerland (P6), respectively. The comparative ranking results of the countries according to the results of LPI, Topsis and Edas methods are as shown in Table 13.

Table 13: Comparative Ranking Results of Countries' Logistics Performance

Countries	LPI Ranking	Topsis Ranking	Edas Ranking
Singapore	1	2	1
Finland	2	1	2
Denmark	3	4	7
Germany	4	6	4
Netherlands	5	7	6
Switzerland	6	8	3
Austria	7	3	10
Belgium	8	9	8
Canada	9	10	5
Hong Kong	10	5	9

According to the Topsis and Edas methods, Singapore ranks first according to the Edas method, Finland ranks first according to the Topsis method, Singapore ranks second and Austria ranks third according to the results of the Topsis method. According to the Edas method, Finland ranks second and Switzerland ranks third. When the results of the analysis are evaluated in general, it is observed that while the first two ranks are similar to the LPI report, the rankings of other countries have changed. The results show that even if the criteria and weights used within the scope of the study are the same, the rankings may be different in MCDM methods. This is because there may be different calculation approaches or theoretical foundations underlying the methods used.

4. CONCLUSION AND RECOMMENDATIONS

In today's competitive environment, customs clearance and logistics services are of great importance. These services cover all processes from the supply of products to their delivery to customers. Fast and reliable delivery processes increase customer satisfaction and ensure that products are delivered to customers on time and undamaged. Therefore, efficient logistics services provide advantages for businesses and countries such as reducing costs, increasing customer satisfaction, gaining competitive advantage and so on. As a result, in order for businesses and industries to achieve sustainable growth and competitiveness, this intricate interaction between the logistics industry and other sectors has become strategically important. Today's business world has made cost-cutting, improving customer happiness, and optimizing logistical processes essential components of success. Therefore, by concentrating on logistics strategies, organizations and industries must increase their comparative advantage and adapt to the changing business environment.

The purpose of this study is to examine and compare in detail the customs, infrastructure and logistics services of the countries at the top of the 2023 LPI rankings with the help of multi-criteria decision-making methods. In this context, LPI criteria including relevant services were taken into account.LPI is an index that shows how competitive a country's logistics sector is and contributes to the development of international trade. In this context, using the World Bank's LPI criteria and the weights of these criteria, the performances of the top 10 countries in the logistics performance ranking were evaluated and ranked by Edas and Topsis methods. The LPI is a crucial metric for evaluating a nation's efficiency in global trade, taking into account its logistics infrastructure, customs clearance, transportation options, logistical neighbors, and other crucial elements.

According to the results of the performance evaluation based on the Topsis and Edas methods, Finland ranks first in the evaluation made with the Topsis method, while Singapore ranks first according to the Edas method. According to the results of the Topsis method, Singapore ranks second, while Austria ranks third. According to the Edas method, Finland ranks second and Switzerland ranks third. When the results of the analysis are evaluated in general, it is observed that the first two ranks are in line with the LPI report, while the rankings of other countries differ. The results of the study show that the different MCDM methods used can produce different results. Because these methods use different approaches, calculation techniques and assumptions, they may produce different results even if they are based on the same data.

The rise of international trade and the development of the logistics sector both strategically depend on this study. As a result, the findings of this study can be used to help decision-makers in this area and enhance a nation's logistics performance. It also significantly advances ongoing research in this area by demonstrating the value of MCDM techniques in making such decisions. Countries with advanced logistics performance have a competitive position in international trade and reduce costs by managing logistics processes efficiently. Therefore, it can be said that logistics performance is a strategic advantage for developed countries. It is suggested that future studies should be extended to different countries or groups of countries and the results obtained by using different MCDM methods should be compared.

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