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Research Article

Analysis of the Prosperity Performances of G7 Countries: An Application of the LOPCOW-based CRADIS Method

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ABSTRACT

The prosperity policies and strategies of major economies have the potential to significantly influence both the global economy and the prosperity of other nations. Therefore, the assessment of the prosperity performance of major economies holds paramount importance. In this context, the primary aim of this research is to evaluate the prosperity performance of G7 countries using the LOPCOW-based CRADIS method, leveraging sub-component values from the Legatum Prosperity Index. The secondary objective is to examine the relationship between a country's prosperity performance assessed through the LOPCOW-based CRADIS method and its quantifiability within the Legatum Prosperity Index (LPI) framework, as well as its associations with other Multi-Criteria Decision-Making (MCDM) methodologies. In the study, the first three most important LPI components according to countries were evaluated as Investment, Governance, and Safety & Security, while the first three least important components were Education, Living Conditions, and Personal Freedom, using the LOPCOW method. The findings reveal the ranking of countries' prosperity performance as follows: Germany, the United Kingdom, Canada, Japan, the United States, France, and Italy. Additionally, an assessment of the average prosperity performance of these countries highlights that the United States, France, and Italy perform below the established average. Consequently, it is imperative for these nations to enhance their prosperity performance to make a more substantial contribution to the global economy. Furthermore, sensitivity and discrimination analysis suggest that countries' prosperity performance can be quantified within the LPI framework. Another noteworthy observation is the strong resemblance of the LOPCOW-based CRADIS method to the MEREC-based CRADIS and the LOPCOW-based MARCOS methods

Keywords: Prosperity, G7 Countries, LOPCOW, CRADIS

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1. Introduction

The increase in a country's level of prosperity extends beyond mere economic growth, encompassing advancements in social, cultural, and human rights domains. This upturn contributes to an enhancement in people's quality of life, encompassing factors such as access to healthcare services, educational opportunities, and essential public services. Furthermore, rising prosperity levels offer opportunities for the development of cultural and societal values, including gender Equation, environmental sustainability, and the strengthening of democratic institutions. Such progress can elevate a country's international standing, rendering it more respected on the global stage and enabling it to exert greater influence in international cooperation and diplomacy. Consequently, an elevation in the level of prosperity has the potential to augment a nation's overall development and enhance its capacity to make a more substantial contribution within the global context.

Measuring the prosperity performance of countries plays a critical role in both economic and social development. These measurements provide guidance to governments when formulating policies and support the effective distribution of resources. Additionally, international comparisons facilitated by these measurements enable countries to learn from each other's prosperity policies, aiming to improve their own prosperity. Prosperity measurements are instrumental in assessing the effectiveness of policies and programs aimed at enhancing people's quality of life and prosperity. Importantly, the dimension of prosperity encompasses not only economic growth but also a wide range of factors such as education, healthcare, environmental sustainability, and social equation. Consequently, measuring countries' prosperity performance is not just an economic endeavour; it is also a crucial tool for improving people's quality of life and building a sustainable future.

Specifically, G7 countries, unlike other countries, have not focused on economic orthodoxies based on total figures such as GDP, economic growth, and job creation as measures of prosperity. Instead, G7 countries can influence the global economy and prosperity formation with openness, inclusiveness, and democratic structures by using human-centered prosperity indices to develop strategies for prosperity and create awareness of prosperity performance. Therefore, it is important to examine the prosperity performance of G7 countries Moreover, considering that G7 countries, which control over half of global capital, can influence global economic policies and the prosperity development of other nations, the analysis of the prosperity performance of G7 countries holds particular significance (Moore et al., 2022).

This study aims to analyze the prosperity performance of G7 countries. The findings of this study will help to identify which countries need to improve their prosperity performance in order to make a greater contribution to the global economy and other dimensions related to the economy. This will increase the opportunity to make inclusive policies on the prosperity dimension globally and will affect countries around the world. In addition, when the prosperity literature is examined, no specific study has been found that focuses on the analysis of prosperity performance of G7 countries. In terms of method, it has been observed that there are limited studies that use the LOPCOW and CRADIS methods together in measuring the performance of

decision alternatives or solving selection problems according to MCDM literature. Therefore, it is considered that this research contributes to both the prosperity and MCDM literature and enriches the relevant literature. The study is considered to have an original and unique quality.

In this context, the primary objective of this research is to measure the prosperity performance of G7 countries for the latest available year, which is 2022, using the values of the Legatum Prosperity Index (LPI) components through the LOPCOW-based CRADIS Multi-Criteria Decision-Making (MCDM) method. The secondary objective is to evaluate the feasibility of measuring countries' prosperity performance within the framework of LPI data using the LOPCOW-based CRADIS MCDM method and to assess the relationships between the LOPCOW-based CRADIS method and other MCDM techniques. In line with these objectives, the literature review section of the research elucidates the concept of prosperity in the context of the research topic, and in terms of methodology, it outlines previous research related to the LOPCOW and CRADIS MCDM methods. Subsequently, the research's conclusions and discussions are drawn based on the findings.

2. Literature Review

The most commonly used measure to gauge a country's overall income is Gross Domestic Product (GDP), which represents the value of all goods and services produced within a country's borders over the course of a year. International standards have been established to determine how GDP is calculated, and as a result, quantities derived from dividing GDP by a country's population have become an essential starting point for measuring prosperity (Mumford, 2016: 226).

The growing disparities between those benefiting from values determining prosperity (quality of life and opportunities) and those left behind in economies and societies have led to the recognition that the measures of progress need to extend beyond economic growth and GDP. This shift reflects the understanding that prosperity's development is crucial. It is now widely acknowledged that within the context of limited planetary resources, the economic sustainability of prosperity is constrained, and the global environmental degradation and climate change issues have adverse effects on prosperity (Moore and Mintchev, 2021: 3). In the pursuit of prosperity, it is not only essential for countries to increase their per capita GDP, but also to combat inEquation, promote social cohesion, protect the environment, and ensure the quality of education, healthcare, and employment opportunities (Woodcraft and Anderson, 2019: 5). Consequently, prosperity can be viewed as an economic, social, and psychological phenomenon that fosters the development of dimensions beyond the economic aspect, alongside the enhancement of social and quality-of-life aspects (Bate, 2009). Pociovălişteanu et al. (2010) have emphasized that while economic growth serves as a foundational element in prosperity, social, vital, and psychological dimensions are crucial factors in enhancing prosperity. According to the Legatum Institute (2023), prosperity is defined as a state in which all individuals have the opportunity to realize their unique potential, contributing to the empowerment of communities and nations. Consequently, the Legatum Institute (2023) underscores that prosperity is not solely a construct created by governments; rather, it can be reinforced by communities through the realization of potential, with

government support. Thus, in accordance with the definition provided by the Legatum Institute (2023), governments play the role of facilitating prosperity potential for communities, while communities assume the role of moderating variables in shaping prosperity.

The measurement of national prosperity performance offers a number of benefits at the economic, social, and political levels. First, these measurements give governments the ability to allocate resources effectively. This allows countries to develop strategic policies for economic growth and social development. Second, prosperity measurements are used in international comparisons, increasing the comparability of countries and helping to share best practices. In addition, these measurements improve the capacity to assess the effectiveness of policies and programs, identify problems, and respond to emerging needs. Prosperity measurements provide a comprehensive view by taking into account a variety of factors, such as economic growth, education, health, environmental protection, and income inEquation, in addition to economic growth. As a result, the measurement of national prosperity performance is a key tool in achieving more equitable, sustainable, and human-centered development goals (Legatum Institute, 2023).

Prosperity is essential for societal improvement and, consequently, development. As countries are aware of their contribution to economic and social prosperity, they can take action to address their prosperity performance gaps, maintain their advantages, and improve their capabilities. Therefore, countries analyse their own and each other's performance to improve their prosperity levels. Within this scope, countries need international, impartial, and objective metrics to measure their prosperity performance (Legatum Institute, 2023).

The Legatum Prosperity Index (LPI) is the only metric that measures the prosperity performance of countries at an international level. The index is composed of three components, 12 subcomponents, and 67 variables. The arithmetic means of the variables, subcomponents, and components can be used to measure the prosperity index values of countries (Legatum Institute, 2023). The descriptions of the LPI's components, subcomponents, and variables are shown in Table 1.

C	Sub-C	Variable	C	Sub-C	Variable
Inclusive Societies	Safety & Security	War & Civil Conflict	Open Economies	Infrastructure & Market Access	Resources
		Terrorism			Transport
		Politically Related Terror & Violence			Border Administration
		Violent Crime			Open Market Scale
		Property Crime			Import Tariff Barriers
	Personal Freedom	Agency		Economic Quality	Labour Force Engagement
		Freedom of Assembly & Association			Fiscal Sustainability
		Freedom of Speech & Access to Information			Macroeconomic Stability
		Access to Information			Productivity & Competitiveness
		Absence of Legal Discrimination			Dynamism
	Governance	Executive Constraints	Empowered People	Living Conditions	Protection from Harm
		Political Accountability			Material Resources
		Rule of Law			Nutrition
		Government Integrity			Basic Services
		Government Effectiveness			Shelter
		Regulatory Quality			Connectedness
		Institutional Trust		Health	Preventative Interventions
	Social Capital	Personal & Family Relationships			Care Systems
		Social Networks			Mental Health
		Interpersonal Trust			Physical Health
		Social Tolerance			Longevity
		Civic & Social Participation			Behavioural Risk Factors
Open Economies	Investment	Property Rights		Education	Primary education
		Investor Protection			Secondary Education
		Contract Enforcement			Tertiary Education
		Financing Ecosystem			Adult Skills
		Restrictions on International Investment			Pre-primary education
	Enterprise Conditions	Domestic Market Contestability		Natural Environment	Exposure to Air Pollution
		Environment for Business Creation			Forest, Land and Soil
		Burden of Regulation			Oceans
		Labour Market Flexibility			Freshwater
		Price Distortions			Preservation Efforts
	Infrastructure & Market Access	Market Distortions			Freshwater
		Communications			Emissions
C:Components, Sub-C: Sub Components					
Source: Legatum Institute, 2023: 9					

Table 1. The Components, Subcomponents, and Variables of LPI

In addition to the Legatum Prosperity Index, there are also other indices that measure dimensions related to the prosperity performance of countries. These indices are shown in Table 2.

Indexes	References
Human Development Index	Conceição, 2022
World Happiness Report	Helliwell vd. 2023
Sustainable Development Goals - SDGs)	United Nations, 2023
Global Peace Index	Institute for Economics & Peace (2023)
Economic Freedom Index	Kim, 2023
Social Progress Index	Green vd, 2022
Climate Change Performance Index	Bruck vd., 2023
Environmental Performance Index	Wolf vd. (2023)

Table 2. Indexes Associated with LPI

As countries improve their prosperity performance, they can also promote the development of economic and social dimensions, as well as other dimensions related to economy and society. Therefore, the prosperity dimension can be considered a broader concept than economic and social dimensions. In this regard, when considering the significance of the well-being dimension for countries, it is possible

to come across numerous studies in the literature related to the well-being dimension.

Kešeljević (2007) investigated the relationship between economic freedom and prosperity dimensions based on the economic freedom and prosperity literature. In this context, the author found that economic freedom is an important prerequisite for prosperity, according to the relevant literature. In addition, the author observed that countries with greater economic freedom tend to have higher economic growth rates and more prosperity. This suggests that the evaluation of the prosperity dimension of countries should also include a detailed examination of other dimensions related to the economy.

Güney (2014) examined the impact of the corruption dimension on the prosperity and sustainability performance dimensions using panel data analysis with data from the LPI, the Global Corruption Perception Index, the Control of Corruption Index, and the Environmental Performance Index between 2009 and 2013. The findings showed that corruption has a significant, negative, and very high impact on the prosperity and sustainability dimensions.

Lee et al. (2017) examined the impact of the transparency dimension on the prosperity dimension of 96 countries between 2008 and 2015 using structural equation modeling. The study found that the transparency dimension has a positive, significant, and high-level impact on the prosperity dimension.

Alotaibi and Alajlan (2021) analyzed the relationship between carbon dioxide (CO2) emissions, the Human Development Index (HDI), and the Legatum Prosperity Index (LPI) using quantile regression within the framework of the Environmental Kuznets Curve (EKC). The findings showed that both LPI and HDI have a negative relationship with CO2 emissions in the quantiles from 0.2 to 1. In addition, urbanization and trade openness were found to have a negative relationship.

Butsaradragoon and Jitmaneeroj (2021) investigated the relationships between the dimensions of prosperity using data mining with data values related to the prosperity dimension of 142 countries. The findings showed that there are positive, significant, and high relationships between the different components that define prosperity. Based on these quantitative results, the study emphasized that different prosperity dimensions should not be given equal weight when designing policies to support national prosperity in the development of prosperity components. The study also concluded that the development of strategies for human capital and education, which are components of the prosperity dimension and contribute the most to the relational structure, will lead to the development of other prosperity components that determine prosperity.

Bubnovskaia et al. (2021) examined the relationship between the security and health dimensions of the 2019 LPI and COVID-19 mortality indicators in 67 countries using Pearson correlation coefficients. The findings showed that the health dimension of a country is more positively associated with COVID-19 mortality than the security dimension. In addition, countries with higher security and health indices had higher mortality rates than countries with lower health indices.

Timmerman et al. (2021) examined the relationship between Hofstede's national culture dimensions and the LPI in 62 countries. In the study, Hofstede's national culture dimensions were tested as predictors of general prosperity, as measured by the LPI. The regression results showed that general prosperity has a negative relationship with power distance, but a positive relationship with individualism, long-term orientation, and indulgence.

Kabakçı Günay and Sülün (2021) investigated the general impact of the social capital component on the prosperity levels of OECD countries by comparing the LPI values of countries with and without the social capital component, which is one of the components that determines the LPI value of countries. The findings showed that social capital has a positive impact on the prosperity rankings of Norway, Denmark, Iceland, New Zealand, Canada, Australia, the United States, Slovenia, Portugal, Israel, and Slovakia. On the other hand, it has a negative impact on the prosperity rankings of Switzerland, the United Kingdom, Luxembourg, France, Belgium, Hungary, the Czech Republic, Greece, Mexico, Latvia, Japan, Lithuania, South Korea, and Turkey. In addition, it was found that the social capital variable did not make a significant difference in the prosperity rankings of the Netherlands, Sweden, Austria, Ireland, Germany, Spain, Estonia, Italy, Chile, Colombia, and Poland.

Alshamrani and Hezam (2023) measured the performance of the 19 countries with the worst performance in the world according to the 2021 LPI using the ENTROPY-based TOPSIS method. The study found that South Sudan had the worst ranking, while Cameroon had the best ranking.

Azar et al. (2023) examined the relationships between the variables in Iran's LPI dimensions using canonical correlation with data from 2021. According to the quantitative results, the correlation coefficient between social capital and health was determined to be 0.89. According to the structural coefficients, life expectancy, physical health, mental health, care systems, preventive interventions, and high-risk behavioral factors were found to have the greatest impact on the canonical variable of health, respectively. According to the standard coefficients, interpersonal trust had the greatest impact on health, and institutional trust, social networks, civil and social participation, and personal and family relationships were found to be among the priority effects of social capital on health. Accordingly, the study concluded that social capital plays an important role in understanding the determinants of health and that it is essential for policy makers to pay special attention to it in order to eliminate health inequalities. In particular, it emphasized the need to give special attention to social capital, one of the most important determinants of health, in addition to equipment- and treatment-oriented strategies.

The Legatum Institute (2023) has ranked the G7 countries in terms of their prosperity performance according to the 2022 Legatum Prosperity Index (LPI) sub-component data. The findings are shown in Table 3.

Countries	LPI	Ranking
Canada	79,63	3
France	76,73	6
Germany	80,81	1
Italy	73,03	7
Japan	78,22	4
United Kingdom	79,95	2
USA	77,44	5
Mean	77,97	
Source: The Legatum Institute, 2023		

Table 3. Countries' LPI Performances and Performance Rankings

Based on Table 3, the LPI values of the countries are ranked as Germany, United Kingdom, Canada, Japan, United States, France, and Italy. The average LPI value of the countries was also measured, and it was found that the countries above the average value were Germany, United Kingdom, Canada, and Japan.

When reviewing the MCDM literature, it has been observed that many researchers utilize LOPCOW for calculating the weights of criteria and CRADIS for measuring the performance of decision alternatives or addressing selection problems. Therefore, in terms of the research methodology, the LOPCOW and CRADIS literature is indicated in Table 4.

Author(s)	Method(s)	Theme
Bektaş (2022)	MEREC, LOPCOW, COCOSO based EDAS	Evaluating the performance of the turkish insurance sector
Puška et al. (2022)	Fuzzy CRITIC based Fuzzy CRITIC	Market assessment of pear varieties
Biswas et al. (2023)	CRADIS	A new grey correlational compromise ranking approach for portfolio selection for inandstment in ESG stocks.
Das and Chakraborty (2023)	MAIRCA, MABAC, MARCOS and CRADIS	Analysis on optimization of end milling processes
Ecer et al. (2023)	LOPCOW based VIKOR	Assess the role of unmanned aerial andhicles for precision agriculture realization in the agri-food 4.0 era.
Gamal et al. (2023)	DEMATEL BASED CRADIS	Select of a responsiand resilient supply chain based on Industry 5.0
Keleş (2023)	LOPCOW based CRADIS	Evaluating of G7 countries and Turkey's livable power center cities
Puška et al. (2023b)	MEREC based CRADIS	Selection of electric cars
Puška et al. (2023c)	ENTROPY based CRADIS	Performance of economic freedom for Balkan countires
Raghunathan and Ecer (2023)	Q-rung Orthopair Bulanık CRADIS	Selection of IoT service provider
Simic et al. (2023)	LOPCOW based ARAS	Prioritizing Industry 4.0-based material handling technologies in smart and sustainable warehouse management systems
Stojanović et al. (2023)	CRITIC based CRADIS	Performance of innovation for Western Balkan countires
Ulutaş et al. (2023a)	PSI, MEREC, LOPCOW and MCRAT	Identifying the most efficient natural fibre for common commercial building insulation materials
Ulutaş et al. (2023b)	FUCOM, CCSD and CRADIS	Selection of building and insulation materials
Yalman et al. (2023)	MEREC and LOPCOW based MARCOS	Assessment of the macroeconomic performance of the Turkish economy
Yılmaz (2023)	LOPCOW based WISP	Analyzing performance of banking sector in Romania

Table 4. LOPCOW and CRADIS Literature

As shown in Table 4, LOPCOW and CRADIS techniques are relatively new and up-to-date methods in the literature. However, it is observed that LOPCOW is often used to

determine the weight coefficients of criteria, while CRADIS is often used to calculate the performance of decision alternatives or in selection problems. However, it has been observed in the literature that the LOPCOW and CRADIS methods are less utilized by researchers compared to some other methods (Weight Coefficient Calculation: ENTROPY, CRITIC, MEREC, SD, SVP, CILOS, IDOCRIW, SECA; Ranking of Decision Alternatives: ARAS, WASPAS, COPRAS, EDAS, TOPSIS) due to their relatively newer and more contemporary nature.

3. Method

3.1. Research Objective, Analysis, Data Set, and Limitations of the Study

The main objective of this study is to measure the prosperity performance of G7 countries. To this end, the LOPCOW-based CRADIS method is used. The second objective of the study is to evaluate the performance of the LOPCOW-based CRADIS method in measuring the prosperity performance of countries. The data set of the study consists of the values of the LPI sub-components of the countries. For convenience, the abbreviations of the LPI sub-components are shown in Table 5.

Sub-Compenents	Abbrevations	Sub-Compenents	Abbrevations
Safety & Security	LPI1	Infrastructure & Market Access	LPI7
Personal Freedom	LPI2	Economic Quality	LPI8
Governance	LPI3	Living Conditions	LPI9
Social Capital	LPI4	Health	LPI10
Investment	LPI5	Education	LPI11
Enterprise Conditions	LPI6	Natural Environment	LPI12

Table 5. LPI Sub-Components Abbreviations

The research was conducted to measure the prosperity performance of G7 countries using the LOPCOW-based CRADIS method. The LPI index was chosen as the basis for measuring prosperity performance because it is more comprehensive, detailed, and up-to-date than other indices. The LPI sub-components were preferred over the LPI components because the number of components is small and the number of variables is large. The LOPCOW method does not have any restrictions on the number of criteria when calculating the importance of criteria for decision alternatives. The most important difference between the LOPCOW method and other objective weighting methods is that it removes the size difference of the data by calculating the standard deviation of the mean square quantity of the series in terms of percentages (Bektaş, 2022: 254-255).

The CRADIS method is a relatively new MCDM method. The most important feature of the method is that it has no restrictions on decision alternatives and criteria when measuring the performance of decision alternatives or in selection problems. The method also relies on simple mathematical operations. In addition, the method has acquired a hybrid and wide-ranging quality by being derived from the combination of ARAS, MARCOS, and TOPSIS methods (Puška et al., 2021). Therefore, the LOPCOW-based CRADIS method was used to measure the prosperity performance of countries due to the advantages of the aforementioned methods.

Due to the limitations of the study, data on prosperity components for only 2022 was used. It is thought that the data on prosperity components for other years of the

countries should be taken into account for the study to have a more comprehensive, informative, and holistic nature.

3.2. The LOPCOW Method

The LOPCOW (Logarithmic Percentage Change-driven Objective Weighting) method is an objective weighting method introduced to the MCDM literature by Ecer and Pamucar (2022). The logic of the method is based on obtaining the appropriate or ideal weights by bringing together data of different sizes. In addition, this method minimizes the gaps between the most important and least important criteria. In addition, LOPCOW takes into account the mutual relationships between criteria (Keleş, 2023: 125). The method is also not affected by negative raw data (Bektaş, 2022: 255). The application steps of the method are as follows (Ecer and Pamucar, 2022: 8).

Step 1: Provision of the Decision Matrix

*i:*1,2,3... m. m: Number of decision alternatives

*j:*1,2,3,... n. n: Number of criteria

X: Decision matrix

d_{ij}: The decision matrix is constructed with the i-th decision alternative on the j-th criterion, using Equation 1.

$$X = [d_{ij}]_{mxn} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Step 2: Normalization of the Decision Matrix$\left(r_{ij}^{x}\right)$

The normalization process is achieved using Equation 2 for benefit-oriented (maximization) criteria and Equation 3 for cost-oriented (minimization) criteria, as specified in Equation 1.

For Benefit-Oriented Criteria:

$$r_{ij}^{x} = \frac{x_{ij} - x_{min}}{x_{maks} - x_{min}} \quad (2)$$

For Cost-Oriented Criteria:

$$r_{ij}^{x} = \frac{x_{maks} - x_{ij}}{x_{maks} - x_{min}} \quad (3)$$

Step 3: Calculation of Weight Percentages for Each Criterion (PV)

In this step, Equation 4 is used to calculate the mean square value as a percentage of the standard deviations of each criterion, such that it eliminates the variance attributable to the size of the data. In Equation 4, σ represents the standard deviation, and ln stands for the natural logarithm.

$$PV_{ij} = In\left|\frac{\sqrt{\sum_{i=1}^{m} r_{ij}^2}}{\sigma}.100\right| \quad (4)$$

Step 4: Determination of Criterion Weights (Degrees of Importance (w_j)

$$w_j = \frac{PV_{ij}}{\sum_k PV_{ij}} \quad (5)$$

3.3. CRADIS Method

The CRADIS method is designed to determine the deviation of alternatives from ideal and anti-ideal solutions. This method is a combined integration of steps from ARAS, MARCOS, and TOPSIS methods. The CRADIS method is a contemporary modeling approach, representing a new way of utilizing steps from existing methods in a unique combination. In this method, alternatives are observed across all criteria, considering both ideal solutions representing the maximum value for an ideal solution and the minimum value for an ideal solution. The steps to apply the CRADIS method are explained below (Puška et al., 2021).

Step 1: Provision of the Decision Matrix

i:1,2,3...*m*, *m*: Number of decision alternatives

j:1,2,3,...n, *n*: Number of criteria

X: Decision matrix

d_{ij}: The decision matrix is constructed with the i-th decision alternative on the j-th criterion, using Equation 6.

$$X = [d_{ij}]_{mxn} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (6)$$

Step 2: Normalization of the Decision Matrix

For Benefit-Oriented Criteria:

$$n_{ij} = \frac{x_{ij}}{x_{jmax}} \quad (7)$$

For Cost-Oriented Criteria:

$$n_{ij} = \frac{x_{jmax}}{x_{ij}} \quad (8)$$

Step 3: Weighting the Decision Matrix

The weighted decision matrix is obtained by multiplying the normalized decision matrix by the corresponding weights. The equation for this weighted decision matrix is described by Equation 9.

$$v_{ij} = n_{ij}.w_j \quad (9)$$

Step 4: Determining the Ideal and Anti-Ideal Solutions

The calculation of the ideal solution is determined by the largest value of v_{ij} in the weighted decision matrix. The calculation of the anti-ideal solution, on the other hand, is identified by finding the smallest value of v_{ij} in the weighted decision matrix.

Calculation of the Ideal Solution:

$$t_i = max v_{ij} \quad (10)$$

Calculation of the Antı-Ideal Solution:

$$t_{ai} = min v_{ij} \quad (11)$$

Step 5: Measurement of Deviations from Ideal and Anti-Ideal Solutions

Measurement of Deviations from Ideal Solutions:

$$d^+ = t_i - v_{ij} \quad (12)$$

Measurement of Deviations from Anti-Ideal Solutions:

$$d^- = v_{ij} - t_{ai} \quad (13)$$

Step 6. Measurement of Deviation Values of Individual Alternatives from Ideal and Anti-Ideal Solutions

Measurement of Deviation Value from Ideal Solutions:

$$S_i^+ = \sum_{j=1}^{n} d^+ \quad (14)$$

Measurement of Deviation Value from Anti-Ideal Solutions

$$S_i^- = \sum_{j=1}^{n} d^- \quad (15)$$

Step 7: Calculation of the Utility Function for Each Alternative Based on Deviations from Optimal Alternatives

For the Ideal Solution

$$K_i^+ = \frac{S_0^+}{S_i^+} \quad (16)$$

For the Anti-ideal Solution:

$$K_i^- = \frac{S_i^-}{S_0^-} \quad (17)$$

S_0^+ represents the optimal alternative with the least distance to the ideal solution. On the other hand, S_0^- can be described as the optimal alternative with the greatest distance to the anti-ideal solution.

Step 8: Ranking Decision Alternatives

The performance of decision alternatives is determined by the average deviation of the alternatives' utility degrees.

$$Q_i = \frac{K_i^+ + K_i^-}{2} \quad (18)$$

The alternative with the highest Q_i value is considered the best or the one with the highest performance.

4. Findings

In order to see the stages more clearly and systematically, the stages are presented in Figure 1, as the subject to be resolved in the decision problem consists of several different aspects and stages.

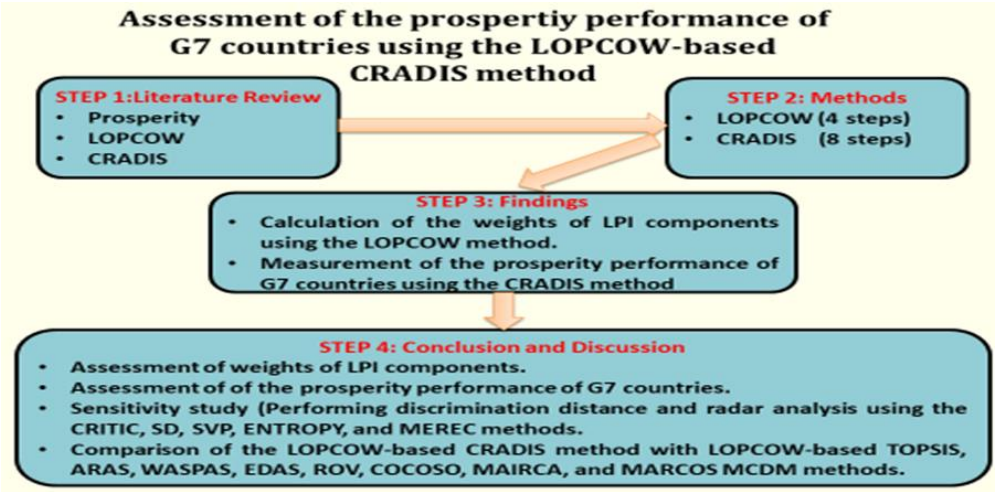

Figure 1. Problem Solving Steps

In the context of the findings, first, the weight coefficients of LPI criteria were measured according to the LOPCOW method. In this regard, the decision matrix with relevant values is shown in Table 6 using Equation 1.

Countries	Canada	France	Germany	Italy	Japan	United Kingdom	USA	Maximum	Minimum
LPI1	87,92	82,98	87,92	86,54	92,78	87,63	72,43	92,78	72,43
LPI2	86,62	79,06	87,7	78,44	79,14	85,64	78,85	87,7	78,44
LPI3	82,34	77,24	84,39	62,33	79,67	80,63	75,18	84,39	62,33
LPI4	73,6	60,6	65,96	60,97	43,82	67,77	73,91	73,91	43,82
LPI5	80,68	79,42	78,87	70,22	83,1	81,49	79,48	83,1	70,22
LPI6	76,22	73,42	79,7	69,62	80,11	78,34	82,85	82,85	69,62
LPI7	77,14	76,98	80,23	73,95	79,32	78,63	80,4	80,4	73,95
LPI8	65,34	65,81	73,96	57,77	66,35	73,31	72,34	73,96	57,77
LPI9	93,49	92,61	94,42	91,51	92,86	94,16	90,74	94,42	90,74
LPI10	78,88	80,46	81,41	80,9	86,5	78,31	73,26	86,5	73,26
LPI11	84,19	81,27	83,45	80	84,93	84,81	83,15	84,93	80
LPI12	69,09	70,87	71,69	64,14	70,11	68,65	66,69	71,69	64,14

Table 6. Decision Matrix Values

In the second step of the LOPCOW method, the normalized matrix values were calculated using Equation 2, and the measured normalized values are presented in Table 7.

Sub-Com.	Orien.	Canada	France	Germany	Italy	Japan	United Kingdom	USA
LPI1	MAX	0,7612	0,5184	0,7612	0,6934	1,0000	0,7469	0,0000
LPI2	MAX	0,8834	0,0670	1,0000	0,0000	0,0756	0,7775	0,0443
LPI3	MAX	0,9071	0,6759	1,0000	0,0000	0,7860	0,8296	0,5825
LPI4	MAX	0,9897	0,5577	0,7358	0,5700	0,0000	0,7959	1,0000
LPI5	MAX	0,8121	0,7143	0,6716	0,0000	1,0000	0,8750	0,7189
LPI6	MAX	0,4989	0,2872	0,7619	0,0000	0,7929	0,6591	1,0000
LPI7	MAX	0,4946	0,4698	0,9736	0,0000	0,8326	0,7256	1,0000
LPI8	MAX	0,4676	0,4966	1,0000	0,0000	0,5300	0,9599	0,8999
LPI9	MAX	0,7473	0,5082	1,0000	0,2092	0,5761	0,9293	0,0000
LPI10	MAX	0,4245	0,5438	0,6156	0,5770	1,0000	0,3814	0,0000
LPI11	MAX	0,8499	0,2576	0,6998	0,0000	1,0000	0,9757	0,6389
LPI12	MAX	0,6556	0,8914	1,0000	0,0000	0,7907	0,5974	0,3377

Table 7. Normalized Decision Matrix

In the third step of the method, Equation 4 was used to measure the PV_{ij} values for each criterion. In the final step of the LOPCOW method, Equation 5 was utilized to calculate the weight coefficients of the criteria. Regarding the calculations, the ranking of criteria based on PV_{ij}values and weight coefficients is presented in Table 8.

Sub-Components	PV_{ij}	w	Ranking
LPI1	53,23494	0,1084018	3
LPI2	1,6423087	0,0033442	12
LPI3	54,528834	0,1110365	2
LPI4	49,613651	0,1010278	4
LPI5	57,102041	0,1162763	1
LPI6	38,46143	0,0783186	8
LPI7	44,561808	0,0907408	5
LPI8	40,775245	0,0830302	7
LPI9	32,086167	0,0653368	11
LPI10	38,449026	0,0782934	9
LPI11	38,328629	0,0780482	10
LPI12	42,305036	0,0861453	6
Total	491,08912		
Mean		0,083333	

Table 8. Ranking of Criteria Based on PV_{ij} and Weight Coefficient Values

According to Table 8, the top three LPI sub-components (criteria) with the highest weight coefficients are LPI5, LPI3, and LPI1. In contrast, the top three LPI components with the lowest weight coefficients are determined as LPI11, LPI9, and LPI2. Additionally, the average LPI weight value of the components has been calculated, and it has been determined that the components with values exceeding this average weight coefficient are LPI1, LPI3, LPI4, LPI5, LPI7, and LPI12. Therefore, based on this result, it is evaluated that, in general, the differences among decision alternatives (countries) for LPI1, LPI3, LPI4, LPI5, LPI7, and LPI12 components are higher compared to the other components.

In terms of findings, secondly, the prosperity performances of decision alternatives (countries) were measured within the framework of the CRADIS method, taking into account the weights of the LPI criteria determined within the LOPCOW method. Accordingly, within the CRADIS method, the decision matrix was first provided with Equation 6. This decision matrix had previously been created using Equation 1 with the assistance of the LOPCOW method, as shown in Table 6. Furthermore, within the CRADIS method, since all LPI components are benefit-oriented, the values of the normalized decision matrix were measured using Equation 7, and the measured values are presented in Table 9.

Sub-Com.	Canada	France	Germany	Italy	Japan	United Kingdom	USA
LPI1	0,947618	0,8943738	0,947618	0,9327441	1	0,9444923	0,7806639
LPI2	0,9876853	0,9014823	1	0,8944128	0,9023945	0,9765108	0,8990878
LPI3	0,975708	0,9152743	1	0,7385946	0,9440692	0,955445	0,8908638
LPI4	0,9958057	0,8199161	0,8924367	0,8249222	0,5928832	0,916926	1
LPI5	0,9708785	0,955716	0,9490975	0,845006	1	0,9806258	0,956438
LPI6	0,9199759	0,8861798	0,9619795	0,8403138	0,9669282	0,9455643	1
LPI7	0,9594527	0,9574627	0,9978856	0,9197761	0,9865672	0,9779851	1
LPI8	0,8834505	0,8898053	1	0,7810979	0,8971065	0,9912115	0,9780963
LPI9	0,9901504	0,9808303	1	0,9691803	0,9834781	0,9972463	0,9610252
LPI10	0,9119075	0,9301734	0,9411561	0,9352601	1	0,9053179	0,8469364
LPI11	0,9912869	0,9569057	0,9825739	0,9419522	1	0,9985871	0,9790416
LPI12	0,9637327	0,9885619	1	0,8946855	0,9779607	0,9575952	0,9302553

Table 9. Normalized Decision Matrix (CRADIS)

In the third step of the method, the weighted decision matrix is determined using Equation 9, and in the fourth step, the values of the ideal solution using Equation 10, and the values of the anti-ideal solution using Equation 11 are measured and presented in Table 10.

Sub-Components	w	Canada	France	Germany	Italy	Japan	United Kingdom	USA
LPI1	0,1084	0,10272	0,09695	0,102723	0,10111	0,1084	0,10238	0,08463
LPI2	0,00334	0,0033	0,00301	0,003344	0,00299	0,00302	0,00327	0,00301
LPI3	0,11104	0,10834	0,10163	0,111037	0,08201	0,10483	0,10609	0,09892
LPI4	0,10103	0,1006	0,08283	0,090161	0,08334	0,0599	0,09264	0,10103
LPI5	0,11628	0,11289	0,11113	0,110358	0,09825	0,11628	0,11402	0,11121
LPI6	0,07832	0,07205	0,0694	0,075341	0,06581	0,07573	0,07406	0,07832
LPI7	0,09074	0,08706	0,08688	0,090549	0,08346	0,08952	0,08874	0,09074
LPI8	0,08303	0,07335	0,07388	0,08303	0,06485	0,07449	0,0823	0,08121
LPI9	0,06534	0,06469	0,06408	0,065337	0,06332	0,06426	0,06516	0,06279
LPI10	0,07829	0,0714	0,07283	0,073686	0,07322	0,07829	0,07088	0,06631
LPI11	0,07805	0,07737	0,07468	0,076688	0,07352	0,07805	0,07794	0,07641
LPI12	0,08615	0,08302	0,08516	0,086145	0,07707	0,08425	0,08249	0,08014
Resolutions								
İdeal Resolutions		0,116276331						
Anti-ideal Resolutions		0,002991111						

Table 10. Weighted Decision Matrix

In the 5th step of the CRADIS method, ideal solution deviations are calculated using Equation 12, and anti-ideal solution deviations are calculated using Equation 13. In this regard, the calculated ideal solution and anti-ideal solution deviation values are presented in Table 11.

Deviation Values for the Ideal Solution							
Sub-Components	**Canada**	**France**	**Germany**	**Italy**	**Japan**	**United Kingdom**	**USA**
LPI1	0,01355	0,01932	0,01355	0,01517	0,0079	0,01389	0,03165
LPI2	0,11297	0,11326	0,11293	0,11329	0,1133	0,11301	0,11327
LPI3	0,00794	0,01465	0,00524	0,03427	0,0115	0,01019	0,01736
LPI4	0,01567	0,03344	0,02612	0,03294	0,0564	0,02364	0,01525
LPI5	0,00339	0,00515	0,00592	0,01802	0	0,00225	0,00507
LPI6	0,04423	0,04687	0,04094	0,05046	0,0405	0,04222	0,03796
LPI7	0,02921	0,0294	0,02573	0,03282	0,0268	0,02753	0,02554
LPI8	0,04292	0,0424	0,03325	0,05142	0,0418	0,03398	0,03506
LPI9	0,05158	0,05219	0,05094	0,05295	0,052	0,05112	0,05349
LPI10	0,04488	0,04345	0,04259	0,04305	0,038	0,0454	0,04997
LPI11	0,03891	0,04159	0,03959	0,04276	0,0382	0,03834	0,03986
LPI12	0,03326	0,03112	0,03013	0,0392	0,032	0,03378	0,03614
Deviation Values for the Anti-Ideal Solution							
Sub-Components	**Canada**	**France**	**Germany**	**Italy**	**Japan**	**United Kingdom**	**USA**
LPI1	0,09973	0,09396	0,09973	0,09812	0,1054	0,09939	0,08163
LPI2	0,00031	2,4E-05	0,00035	0	3E-05	0,00027	1,6E-05
LPI3	0,10535	0,09864	0,10805	0,07902	0,1018	0,1031	0,09593
LPI4	0,09761	0,07984	0,08717	0,08035	0,0569	0,08964	0,09804
LPI5	0,1099	0,10814	0,10737	0,09526	0,1133	0,11103	0,10822
LPI6	0,06906	0,06641	0,07235	0,06282	0,0727	0,07106	0,07533
LPI7	0,08407	0,08389	0,08756	0,08047	0,0865	0,08575	0,08775
LPI8	0,07036	0,07089	0,08004	0,06186	0,0715	0,07931	0,07822
LPI9	0,0617	0,06109	0,06235	0,06033	0,0613	0,06217	0,0598
LPI10	0,06841	0,06984	0,0707	0,07023	0,0753	0,06789	0,06332
LPI11	0,07438	0,07169	0,0737	0,07053	0,0751	0,07495	0,07342
LPI12	0,08003	0,08217	0,08315	0,07408	0,0813	0,0795	0,07715

Table 11. Ideal and Anti-Ideal Deviation Solution Values

In the 6th step of the method, the deviation measures of individual alternatives from the ideal solution are calculated using Equation 14, and from the anti-ideal solution using Equation 15. Subsequently, in the 7th step, for each decision alternative, utility functions are computed for the ideal solution using Equation 16 and for the anti-ideal solution using Equation 17 based on the deviations from the most favorable alternatives. In the final step of the method, the prosperity performance values of decision alternatives are calculated using Equation 18. The determined values are explained in Table 12.

Countries	S_i^+	S_i^-	K_i^+,	K_i^-	Q_i	**Ranking**
Canada	0,43851	0,92091	0,97356	0,98757	0,98056	3
France	0,47284	0,88659	0,90288	0,95076	0,92682	6
Germany	0,42692	0,93251	1	1	1	1
Italy	0,52634	0,83308	0,8111	0,89338	0,85224	7
Japan	0,45831	0,90111	0,9315	0,96633	0,94891	4
United Kingdom	0,43535	0,92407	0,98063	0,99095	0,98579	2
USA	0,46061	0,89882	0,92686	0,96387	0,94537	5
Minimum	0,42692	0,83308				
Maximum	0,52634	0,93251				
Mean					0,94853	

Table 12. S_i^+, S_i^-, K_i^+, K_i^- ve Q_i Values

When examining Table 12, the prosperity performance values of the countries are ranked as Germany, the United Kingdom, Canada, Japan, the United States, France, and Italy. Furthermore, based on Table 12, Italy stands out with significantly lower prosperity performance compared to other countries. Additionally, the average prosperity performance value of countries has been calculated, and it was determined that the countries with performance values below the average are the United States, France, and Italy.

From a methodological perspective, a sensitivity analysis of the prosperity performance of countries has been provided using the LOPCOW-based CRADIS method. Sensitivity analysis in the MCDM literature can be conducted by comparing values and rankings obtained by applying different criteria weighting methods using the same data (Gigovič, 2016: 24). In this context, first, the weighting coefficient values of LPI components for countries were measured according to different weighting methods (ENTROPY, CRITIC, SVP: Statistical Variance Procedure, SD: Standard Deviation, MEREC), and the measured values and rankings are presented in Table 13.

Components	LOPCOW		CRITIC		SD	
	Value	Ranking	Value	Ranking	Value	Ranking
LPI1	0,108402	3	0,099563	3	0,10287	4
LPI2	0,003344	12	0,117154	2	0,070142	7
LPI3	0,111037	2	0,056934	12	0,129157	2
LPI4	0,101028	4	0,13761	1	0,218996	1
LPI5	0,116276	1	0,057993	11	0,071959	6
LPI6	0,078319	8	0,069724	7	0,079602	5
LPI7	0,090741	5	0,067	10	0,039919	10
LPI8	0,08303	7	0,072598	6	0,116878	3
LPI9	0,065337	11	0,084889	5	0,019914	12
LPI10	0,078293	9	0,099068	4	0,068132	8
LPI11	0,078048	10	0,069164	8	0,030541	11
LPI12	0,086145	6	0,068304	9	0,05189	9
Components	**SVP**		**ENTROPY**		**MEREC**	
	Value	**Ranking**	**Value**	**Ranking**	**Value**	**Ranking**
LPI1	0,127959	3	0,090199	4	0,08427	3
LPI2	0,054909	6	0,040352	7	0,069609	12
LPI3	0,165917	2	0,144398	2	0,089504	2
LPI4	0,328892	1	0,428667	1	0,109061	1
LPI5	0,053426	7	0,043804	6	0,077293	11
LPI6	0,062375	5	0,052809	5	0,077612	10
LPI7	0,016025	10	0,013208	10	0,082464	6
LPI8	0,104242	4	0,114885	3	0,080691	9
LPI9	0,005632	12	0,003267	12	0,082297	7
LPI10	0,049007	8	0,038335	8	0,081565	8
LPI11	0,010621	11	0,007712	11	0,082955	4
LPI12	0,020996	9	0,022365	9	0,082678	5

Table 13. Weights of LPI criteria and Rankings of Values According to Methods

When Table 13 is examined, it can be observed that the rankings of the weight coefficients of LPI criteria determined by the LOPCOW method are mostly different from the rankings determined by other methods. In the sensitivity analysis, secondly; countries' LPI performances were measured using the CRADIS method based on CRITIC, SD, SVP, ENTROPY, and MEREC, and the measured values were ranked. The relevant quantities are presented in Table 14.

Countries	LOPCOW-CRADIS		CRITIC-CRADIS		SD-CRADIS	
	Value	Ranking	Value	Ranking	Value	Ranking
Canada	0,9805626	3	0,9875294	2	0,997932	2
France	0,9268187	6	0,9075717	6	0,939844	5
Germany	1	1	1	1	1	1
Italy	0,85224	7	0,8497648	7	0,8927096	7
Japan	0,9489132	4	0,9094512	5	0,9226814	6
United Kingdom	0,9857903	2	0,9836179	3	0,9926964	3
USA	0,9453652	5	0,9363035	4	0,9758516	4
Countries	**SVP-CRADIS**		**ENTROPY-CRADIS**		**MEREC-CRADIS**	
	Value	**Ranking**	**Value**	**Ranking**	**Value**	**Ranking**
Canada	1	1	1	1	0,9582571	3
France	0,941878	5	0,9388853	5	0,8237725	6
Germany	0,9906546	2	0,984709	3	1	1
Italy	0,9091974	7	0,9111657	6	0,6744694	7
Japan	0,9104635	6	0,8910843	7	0,851087	5
United Kingdom	0,9876949	3	0,9846224	4	0,9642433	2
USA	0,979489	4	0,9884772	2	0,8776969	4

Table 14. Countries' LPI performances using the CRADIS method based on CRITIC, SD, SVP, ENTROPY, and MEREC

When Table 14 is examined, it is observed that the rankings of countries' prosperity performance measured by the LOPCOW-based CRADIS method are largely different from the rankings of countries' prosperity performances measured by the other weight-based CRADIS method. Additionally, with respect to prosperity performances, the differentiation analysis graph of methods for countries is presented in Figure 2.

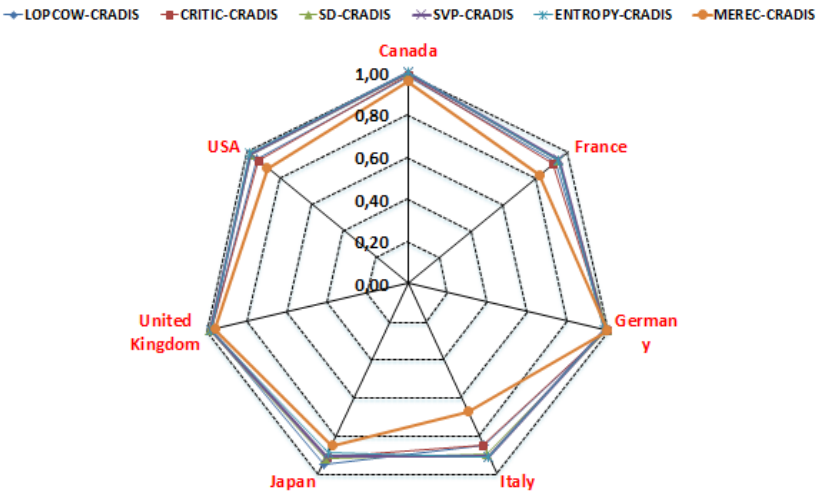

Figure 2. Radar Visualization of Methods by Countries

When examining Figure 2, it can be observed that the methods generally do not intersect on the same axis for countries and are generally located at different points accordingly. Especially in Italy, France, the United States, and Japan, the distinction between the methods has become more pronounced, while in Canada, Germany, and the United Kingdom, the proximity of the methods to each other has occurred. Additionally, the visual representation of the separation distance of methods by countries is shown in Figure 3

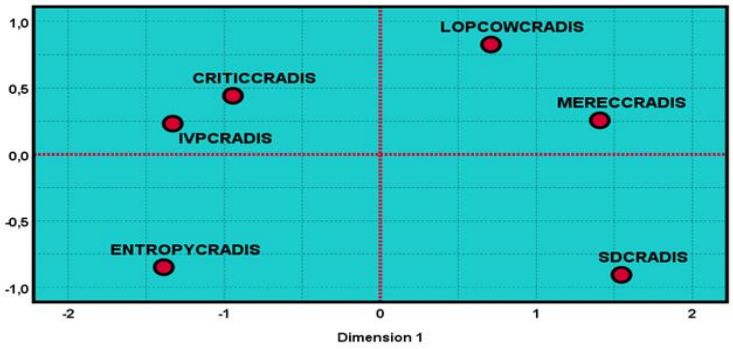

Figure 3. Discriminant Visualization of Methods by Countries

When examining Figure 3, it is observed that the methods are positioned differently in space. Particularly, according to Figure 2, the LOPCOW-CRADIS method exhibits a stronger positive proximity to the MEREC-CRADIS and CRITIC-CRADIS methods compared to other methods. Therefore, it is considered that the LOPCOW-CRADIS method has stronger positive relationships with the MEREC-CRADIS and CRITIC-CRADIS methods compared to other methods. Based on this, the relationship matrix between the methods is presented in Table 15.

Methods	LOPCOW CRADIS	CRITIC CRADIS	SD CRADIS	SVP CRADIS	ENTROPY CRADIS	MEREC CRADIS
LOPCOW-CRADIS	1					
CRITIC-CRADIS	0,960**	1				
SD-CRADIS	0,902**	0,972**	1			
İVP-CRADIS	0,785**	0,908**	0,975**	1		
ENTROPİ-CRADIS	0,663*	0,816**	0,921**	0,983**	1	
MEREC-CRADIS	0,992**	0,986**	0,944**	0,851**	0,742**	1
p**<.01, p*<.05						

Table 15. Correlation Values between LOPCOW, CRITIC, SD, SVP, ENTROPY, and MEREC-Based CRADIS Methods

According to Table 15, the LOPCOW-based CRADIS method has significant positive relationships with other weight-based CRADIS methods. In particular, the LOPCOW-based CRADIS method exhibits very high positive correlations with the MEREC-based CRADIS and CRITIC-based CRADIS methods.

Furthermore, in terms of methodology, the prosperity performance of countries was measured based on LOPCOW, and the measured values were ranked alongside commonly used methods in the MCDA literature, such as TOPSIS, ARAS, WASPAS, EDAS, ROV, COCOSO, MAIRCA, and MARCOS. These rankings are presented in Table 16.

Countries	LOPCOW ARAS		LOPCOW COPRAS		LOPCOW WASPAS		LOPCOW GRA		LOPCOW MAUT	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Canada	0,9567	3	0,9888	3	0,7827	1	0,6685	4	0,4492	7
France	0,9211	6	0,9518	6	0,5725	5	0,5451	6	0,7767	5
Germany	0,9677	1	1,0000	1	0,7822	2	0,7908	1	0,9065	3
Italy	0,8678	7	0,8967	7	0,3939	7	0,4049	7	0,6642	6
Japan	0,9340	5	0,9648	5	0,4877	6	0,7559	2	0,8861	4
United Kingdom	0,9593	2	0,9914	2	0,7759	3	0,7183	3	0,9566	1
USA	0,9345	4	0,9658	4	0,6360	4	0,6418	5	0,9209	2
Countries	**LOPCOW COCOSO**		**LOPCOW MARCOS**		**LOPCOW MAIRCA**		**LOPCOW ROV**		**LOPCOW RAFSI**	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Canada	9,2E+13	1	0,6932	3	0,0543	3	0,3541	4	0,1971	5
France	2,8E+09	3	0,6679	6	0,0931	6	0,2749	6	0,2416	3
Germany	4,1E+13	2	0,7034	1	0,0276	1	0,4173	1	0,1687	7
Italy	1,6E+00	5	0,6358	7	0,1541	7	0,0958	7	0,6409	1
Japan	2,4E+00	4	0,6810	4	0,0560	4	0,3780	3	0,2392	4
United Kingdom	7,7E-01	6	0,6960	2	0,0425	2	0,3866	2	0,1818	6
USA	5,7E-01	7	0,6741	5	0,0895	5	0,2861	5	0,3584	2

Table 16. Prosperity Performance Values and Rankings of Countries According to Different MCDM Methods Based on LOPCOW

When Tables 12 and 16 are examined together, it is observed that the ranking of countries' prosperity performance values calculated by the LOPCOW-based CRADIS method is fully consistent with the ranking of countries' prosperity performance values calculated by the LOPCOW-based MARCOS and MAIRCA methods. In addition, according to both tables, the ranking of countries' prosperity performance values measured by the LOPCOW-based CRADIS method is similar to the rankings of countries' prosperity performance values calculated by the LOPCOW-based ARAS and COPRAS methods. This is shown in Figure 4, along with the discriminant diagrams of the methods.

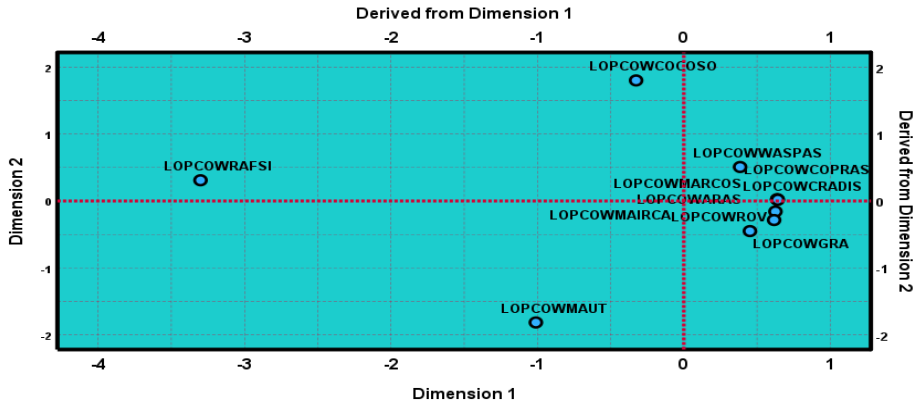

Figure 4. Discriminant Visualization among LOPCOW-Based MCDM Method

When examining Figure 4, it can be observed that the proximity of the LOPCOW-based CRADIS method to the LOPCOW-based ARAS, COPRAS, WASPAS, GRA, MARCOS, MAIRCA, and ROV methods is very high, and the relationships between these methods are positive and very strong. The correlation values among LOPCOW-based MCDM methods are shown in Table 17.

Methods	1	2	3	4	5	6	7	8	9	10	11
1	1										
2	0,999**	1									
3	0,904**	0,905**	1								
4	0,904**	0,903**	0,662	1							
5	0,242	0,241	0,044	0,430	1						
6	0,473	0,474	0,594	0,278	-0,696	1					
7	0,993**	0,993**	0,884**	0,925**	0,240	0,481	1				
8	0,968**	0,967**	0,801*	0,959**	0,300	0,406	0,987**	1			
9	0,957**	0,955**	0,750	0,969**	0,343	0,344	0,970**	0,992**	1		
10	-0,930**	-0,929**	-0,769*	-0,843*	-0,218	-0,377	-0,928**	-0,937**	-0,949**	1	
11	0,994**	0,994**	0,901**	0,912**	0,245	0,476	0,998**	0,995**	0,961**	-0,927**	1
**p<.01, *p<.05											
ARAS(1), COPRAS(2), WASPAS(3), GRA(4), MAUT(5), COCOSO(6), MARCOS(7), MAIRCA(8), ROV(9), RAFSI(10), CRADIS(11)											

Table 17. Correlation Values among LOPCOW-Based MCDM Methods

According to Table 17, it has been observed that the LOPCOW-based CRADIS method has the highest level of relationships with LOPCOW-based ARAS, COPRAS, WASPAS, GRA, MARCOS, MAIRCA, and ROV methods. Based on the consistency ranking in Table 16, the proximity in the discrimination distance visualized in Figure 3, and the correlation analysis in Table 17, it can be concluded that the LOPCOW-based CRADIS method is most similar to the LOPCOW-based MARCOS and MAIRCA methods.

5. Conclusion and Discussion

In today's global economy, the strategies that countries develop to enhance their own prosperity performance play a significant role in the development of the global economy and other dimensions related to economics. This is because the prosperity performance of countries plays a critical role in international economic and trade relations and in shaping economic policies, thus providing a fundamental resource to promote sustainable and inclusive economic growth worldwide. Particularly, the prosperity policies of major economies can impact the prosperity enhancement strategies of other countries, influencing global prosperity and the economy. In this context, this research measured the prosperity performance of G7 countries for the latest and most current year, 2022, using the LOPCOW-based CRADIS method based on the values of LPI components.

In the research, firstly, the weight coefficient values of LPI components for each country were measured, and the measured values were ranked. According to the findings, the top three most important LPI criteria for countries were determined to be Investment (LPI5), Governance (LPI3), and Safety & Security (LPI1), while the least important LPI criteria were found to be Education (LPI11), Living Conditions (LPI9), and Personal Freedom (LPI2), respectively. According to Table 4, the top three LPI criteria with the highest weight coefficients were Investment (LPI5), Governance (LPI3), and Safety & Security (LPI1), whereas the three LPI components with the lowest weight coefficients were identified as Education (LPI11), Living Conditions (LPI9), and Personal Freedom (LPI2). Therefore, based on this result, it can be observed that for G7 countries, strengthening the economy within the investment environment, especially in terms of economic stability in the investment climate, and in terms of governance, accountability, and oversight of governments to create economic policies, as well as overall ensuring security for economic investments and initiatives, are more critical. On the other hand, in general, G7 countries do not face significant issues in terms of living conditions, freedom, and education compared to

other countries; hence, Education (LPI11), Living Conditions (LPI9), and Personal Freedom (LPI2) criteria are not considered as important criteria for G7 countries. This situation indicates that Investment, Governance, and Safety & Security criteria exhibit variations in potential among G7 countries, although there are no significant differences in general among G7 countries. Furthermore, the average LPI weight was calculated for countries based on LOPCOW-based CRADIS measurement, and the criteria that had values exceeding this average weight were identified as Safety & Security (LPI1), Governance (LPI3), Social Capital (LPI4), Investment (LPI5), Infrastructure & Market Access (LPI7), and Natural Environment (LPI12). Consequently, it was concluded that, in general, these criteria (LPI1, LPI3, LPI4, LPI5, LPI7, and LPI12) exhibit more pronounced variation in differences among decision alternatives compared to other criteria.

Secondly, in the research, the prosperity performances of countries were measured using the LOPCOW-based CRADIS method and ranked accordingly. According to the research results, the prosperity performances of countries were ranked as Germany, the United Kingdom, Canada, Japan, the United States, France, and Italy. Additionally, the average prosperity performances of countries were calculated, and it was observed that the countries with values below the average prosperity performance were the United States, France, and Italy.

In the research, thirdly, a sensitivity analysis of the LOPCOW-based CRADIS method was conducted in terms of methodology. For this purpose, the weights and importance degrees of LPI criteria for countries were calculated using different objective weight criteria calculation methods (CRITIC, SD, SVP, ENTROPY, and MEREC), and countries' prosperity performance values were measured and ranked based on the CRADIS approach. Upon examining the findings, it was observed that the ranking of countries' prosperity performance values measured by the LOPCOW-based CRADIS method was different from the rankings obtained using other weight-based CRADIS methods. This was further explained through radar and discriminant visualizations, leading to the conclusion that the LOPCOW-based CRADIS method is sensitive in measuring countries' prosperity performance within the scope of LPI. Therefore, it was concluded that countries' prosperity performances within the scope of LPI can be explained using the LOPCOW-based CRADIS method. Additionally, through discriminant visualizations and correlation analyses, it was found that the LOPCOW-based CRADIS method is most similar to the MEREC-based CRADIS and LOPCOW-based MARCOS methods.

When reviewing the literature, it is evident that countries' prosperity performances for the year 2022 were measured and reported using the Legatum Institute's LPI (2023). According to this report, the prosperity performances of G7 countries were ranked as Germany, the United Kingdom, Canada, Japan, the USA, France, and Italy. This ranking is entirely consistent with the ranking determined within the scope of the current research. Additionally, the report indicates that countries performing below the average performance level are Italy, France, and the USA, while countries performing above the average level are Germany, the United Kingdom, Canada, and Japan. In the current study, it was found that the countries falling below and above the average prosperity performance, as determined by the LOPCOW-based CRADIS method, are entirely consistent with the findings reported by the Legatum Institute (2023).

In the literature, it has been observed that there is limited research examining countries' prosperity performances using MCDA methods. Furthermore, in the context of MCDA literature, the LOPCOW and CRADIS methods, being relatively new and up-to-date, have been less utilized compared to other methods. Therefore, this study is considered to contribute to the literature on countries' prosperity in terms of its research topic and enrich the MCDA literature by employing the LOPCOW and CRADIS methods. Limited data on prosperity components was only available for 2022, which constrained the scope of the study. To make the study more comprehensive, informative, and holistic, it is recommended that data on prosperity components for other years be collected and analyzed.

6. Recommendations

6.1 Recommendations in terms of policy and administrative implications

Under the recommendations, firstly, G7 countries can enhance their contributions to the global economy and global prosperity by implementing policies and initiatives aimed at the development of all LPI criteria. Specifically, they can focus on strategies to improve the criteria Safety & Security (LPI1), Governance (LPI3), Social Capital (LPI4), Investment (LPI5), Infrastructure & Market Access (LPI7), and Natural Environment (LPI12), which have weights greater than the average weight. Additionally, countries with prosperity performances below the average, such as the United States, France, and Italy, can provide solutions that are more prosperity-oriented to contribute added value to the formation of global prosperity on a global scale.

6.2 Recommendations in the context of methodology

In terms of methods, countries' prosperity performances can be measured using LOPCOW and other objective weight-based methods (ENTROPY, CRITIC, SVP, SD, MEREC, SECA, CILOS) along with various multi-criteria decision-making techniques (TODIM, EDAS, VIKOR, ELECTRE, MABAC, MOOSRA, MULTIMOORA, PIV, OCRA, LBWA, TOPSIS, CODAS, etc.). This would allow for comprehensive comparisons of the measured values and rankings within the framework of different methods. Finally, to calculate countries' LPI performances more accurately, the number of components, subcomponents, and variables related to countries' prosperity performances can be increased, or country-specific LPI components, subcomponents, and variables can be developed.

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