EVALUATION OF THE LEVEL OF BEING DIGITAL SOCIETY OF THE SIX WESTERN BALKAN (WB6) COUNTRIES CONSIDERING DIGITAL SOCIETY POLICY WITH MOORA METHOD

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Abstract
In today's world, cloud computing, automation, artificial intelligence, machine learning, blockchain, internet of things and advanced information communication technologies have become an inextricable part of sectors such as production, manufacturing, communication, economy, finance, education, health. Besides, digital technologies are deeply integrated into daily and social life; the society in which we live is called as digital society. Moreover, trust relationship between people and organizations are reshaped in digital society. Trust has built from being based on human-to-human relationships to a digital platform or algorithm-based understanding. Cybersecurity, data privacy and security are becoming increasingly important for building trust. Literature review reveals that there are limited number of studies combining Balkan countries, Multi-Criteria Decision Making (MCDM) methods, and digital society. Objective of this study includes contributing to literature by providing a guide for digital policymakers in strategic decision-making. This study aims to evaluate the level of being digital society of Six Western Balkan (WB6) countries (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia) considering digital society policy. While determining criteria, Organization for Economic Cooperation and Development (OECD) Western Balkans Competitiveness Data Hub is utilized. Two sub-categories of digital society policy namely "society" and "trust" were considered as dimensions. "Digital inclusion framework" and "green digital technologies" were considered as criteria belongs to society dimension. "Privacy and data protections", "consumer protection in e-commerce" and "cybersecurity" were considered criteria as trust dimension. Unique dataset was built on 2024 and were collected from OECD Western Balkans Competitiveness Data Hub regarding to determined five criteria. Equal weights were assigned to each criterion. WB6 countries were ranked according to their level of being digital society with implementing MOORA method. Level of being digital society ranking results of WB6 countries from highest to lowest as follows: Kosovo, Albania, Serbia, Montenegro, North Macedonia, Bosnia and Herzegovina.
Keywords: Digital Society, Western Balkan (WB6) Countries, Multi-criteria Decision Making (MCDM), Multi-Objective Optimization on the basis of Ratio Analysis (MOORA)

1. Introduction

The state-of-the-art technologies such as cloud computing, automation, artificial intelligence, machine learning, blockchain, internet of things and advanced information communication technologies compose the backbone of sectors such as production, manufacturing, communication, economy, finance, education, health in today's rapid changing world (Aleksandrova et al., 2022; Kong et al., 2024). In addition to the business; daily and social life get highly affected by the integration of the digital technologies. The society in which we live becomes more adopted to digital features and it is called as digital society. Moreover, meaning of the trust in today's world between people and organizations is reshaped in digital society. Nowadays, in the digital environment, trust building has become algorithm-based rather than human-to-human relationships (Guo, 2022). For building trust; there is a significant need for providing environments which have high level of maturity of cybersecurity, data privacy and security (O'Neill, 2012). This study was structured around and considered the three research questions (RQ) given below.

- RQ 1: Has the interest in literature about digital society increased in the post-pandemic era?
- RQ 2: What are the criteria of being the digital society?
- RQ 3: What is the ranking of the Six Western Balkan countries from highest to lowest in terms of being the digital society potential considering digital society policy?

Literature review was conducted to answer the RQ 1 by searching following two queries which are "Balkan countries + digital society" and "Balkan countries + digital society + multi-criteria decision making" in Google Scholar database. Only journal articles were included in the review process based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology for studies published in 2019 and afterwards, considering the post-COVID-19 period. The results of conducted literature review are presented in Table 1 and Figure 1.

Table 9. Number of articles published after COVID-19 period

	Query 1	Query 2
Query	"Balkan countries + ecotourism"	"Balkan countries + ecotourism + multi-criteria decision making"
Year	Number of Articles Published	Number of Articles Published
2019	82	10
2020	134	15
2021	175	17
2022	201	12
2023	211	21
2024	302	26
2025	387	42
Total	1492	143

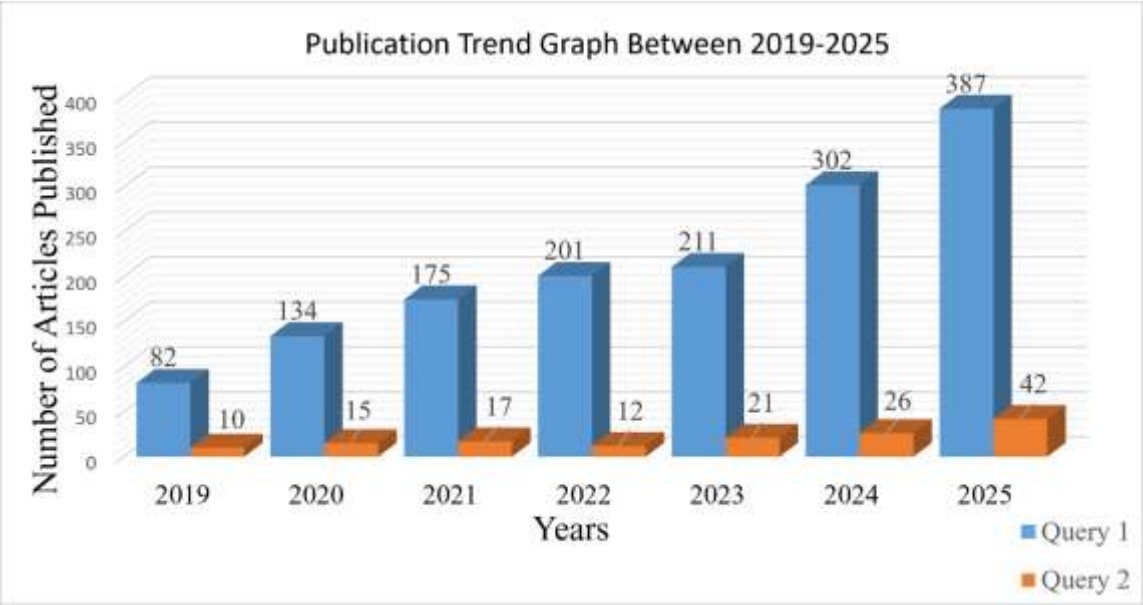

Figure 1. Publication trend graph between 2019-2025

Literature review reveals that there are limited number of studies combining Balkan countries, Multi-Criteria Decision Making (MCDM) methods, and digital society. Objective of this study includes contributing to the literature by providing a guide for digital policymakers in strategic decision-making. This study aims to evaluate the level of being digital society of Six Western Balkan (WB6) countries (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia) considering digital society policy.

5. Materials and Methods

While determining criteria, Organization for Economic Cooperation and Development (OECD) Western Balkans Competitiveness Data Hub is utilized. Two sub-dimensions of digital society policy namely "society" and "trust" were considered as dimensions. "Digital inclusion framework" and "green digital technologies" were considered as criteria belongs to society dimension. "Privacy and data protections", "consumer protection in e-commerce" and "cybersecurity" were considered criteria as trust dimension. The unique dataset was built on latest data available belongs to the year 2024 were collected from OECD Western Balkans Competitiveness Data Hub regarding to determined five criteria regarding to the digital society policy data which is under the 15 key policies.

Table 10. Criteria for Digital Society (OECD Western Balkans Competitiveness Data Hub, 2026)

Main Dimension	Dimension	No	Criterion	Explanation
Digital Society	Society	Criterion 1	Digital inclusion framework	A socio-economic measure of how involved and adaptable society is to digital integration.
Digital Society	Society	Criterion 2	Green digital technologies	The measure of the sustainability of digitalization by limiting its negative impacts on the environment and climate.

Table 11. continued

Digital Society	Trust	Criterion 3	Privacy and data protections	The measure of ensuring and protecting personal privacy. It establishes a regulatory and deterrent framework against cyber threats that could compromise the security of personal information.
Digital Society	Trust	Criterion 4	Consumer protection in e-commerce	In e-commerce, it is a measure of establishing a legal and institutional framework to protect consumers on websites.
Digital Society	Trust	Criterion 5	Cybersecurity	The measure of cybersecurity risk management that extends across the economy to increase trust in the digital environment and facilitate the adoption of digital services.

Multi-Objective Optimization by Ratio Analysis (MOORA) method is one of the Multi-Criteria Decision Making (MCDM) methods which was introduced in the study of Brauers & Zavadskas (2006). MOORA is utilized to solve various complex MCDM problems (Karakoç et al., 2023). MOORA method provides multi-attribute optimization simultaneously under predetermined constraints with considering ratio analysis. The steps of the MOORA method are given as follows (Chakraborty, 2011; Güneş & Sennaroğlu, 2026; Schmohl et al. 2025):

Step 1. The decision matrix is built and denoted as $X = \left[x_{ij}\right]_{m\times n}$.

There are m number of alternatives and n number of criteria. x_{ij} denotes the performance of the ith alternative on the jth criterion.

Step 2. The normalized decision matrix is denoted as $N = \left[n_{ij}\right]_{m\times n}$.

Normalized performance values are dimensionless in a range [0,1] and are calculated by using Equation (1).

$$n_{ij} = \frac{x_{ij}}{\left[\sum_{i=1}^{m} x_{ij}^2\right]^{1/2}} \quad (1)$$

Denominator of Equation (1) is the square root of the sum of squares of each alternative per criterion which considered as the best option between ratio systems.

Step 3. The normalized decision matrix is multiplicated with criterion weights and the weighted normalized decision matrix is built and denoted as $W = \left[w_{ij}\right]_{m\times n}$ where w_j represents criterion weights.

Step 4. Multi-attribute optimization problem is transformed to form of Equation (2):

$$y_i = \sum_{j=1}^{g} w_j\, n_{ij} - \sum_{j=g+1}^{n} w_j\, n_{ij} \quad (2)$$

6. Findings and Discussion

The findings of MOORA method applied are given in Table 3, Table 4, Table 5 and Table 6 step by step respectively.

Step 1.

Table 12. The decision matrix

Weights	0.200	0.200	0.200	0.200	0.200
Criterion	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5
Unit of measure	Proportion (%)	Proportion (%)	Proportion (%)	Proportion (%)	Proportion (%)
Min/Max	max	max	max	max	max
Albania	50.00	40.00	50.00	50.00	70.00
Bosnia and Herzegovina	30.00	20.00	40.00	30.00	30.00
Kosovo	50.00	40.00	70.00	60.00	60.00
Montenegro	50.00	20.00	50.00	70.00	50.00
North Macedonia	30.00	10.00	50.00	50.00	40.00
Serbia	50.00	20.00	70.00	70.00	70.00
$\left[\sum_{i=1}^{m} x_{ij}^2\right]^{1/2}$	108.63	67.08	137.48	138.92	135.65

Step 2.

Table 13. The normalized decision matrix

Criterion	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5
Min/Max	max	max	max	max	max
Albania	0.460	0.596	0.364	0.360	0.516
Bosnia and Herzegovina	0.276	0.298	0.291	0.216	0.221
Kosovo	0.460	0.596	0.509	0.432	0.442
Montenegro	0.460	0.298	0.364	0.504	0.369
North Macedonia	0.276	0.149	0.364	0.360	0.295
Serbia	0.460	0.298	0.509	0.504	0.516

Step 3.

Table 14. The weighted normalized decision matrix

Criterion	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5
Min/Max	max	max	max	max	max
Albania	0.092	0.119	0.073	0.072	0.103
Bosnia and Herzegovina	0.055	0.060	0.058	0.043	0.044
Kosovo	0.092	0.119	0.102	0.086	0.088
Montenegro	0.092	0.060	0.073	0.101	0.074
North Macedonia	0.055	0.030	0.073	0.072	0.059
Serbia	0.092	0.060	0.102	0.101	0.103

Step 4.

Table 15. Assessment results of alternatives

	sum of max	sum of min	assessment of alternative	rank
Albania	0.4592	0.0000	0.4592	2
Bosnia and Herzegovina	0.2605	0.0000	0.2605	6
Kosovo	0.4880	0.0000	0.4880	1
Table 6. continued				
Montenegro	0.3989	0.0000	0.3989	4
North Macedonia	0.2887	0.0000	0.2887	5
Serbia	0.4575	0.0000	0.4575	3

Final ranking results of WB6 countries are provided in Table 7. Kosovo is ranked at top while Bosnia and Herzegovina is ranked at last.

Table 16. Final ranking results of alternatives

No	Country
1	Kosovo
2	Albania
3	Serbia
4	Montenegro
5	North Macedonia
6	Bosnia and Herzegovina

Ranking results are compared with population and demographics data in Table 8.

Table 17. Comparison of population and demographics

No	Country	Population (2024)	Percentage of citizens under 65 years old
1	Kosovo*	1,774,000	90.9
2	Albania*	2,760,000	83.5
3	Serbia	6,600,000	77.6
4	Montenegro	624,000	83.3
5	North Macedonia	1,830,000	81.9
6	Bosnia and Herzegovina	3,160,000	Not available

* 2022 or 2023 data instead of 2024

According to the data for demographics of Eurostat (2026), Kosovo has the youngest population in Europe with having %90.9 of citizens under 65 years old, this situation may lead an advantage for being digital society despite its small population. Furthermore, given the young population structure, this could also explain the relatively high digital society performance by overcoming the limitations of traditional infrastructure.

7. Conclusion and Recommendations

Today, technology and society have become inseparable from each other. Evaluating the level of being digital society is crucial for shaping the future of countries and determining the right policies and actions. In this study, with considering equal weights (0.200) for each criterion, WB6 countries were ranked according to their level of being digital society with applying MOORA method. The level of being digital society ranking results of WB6 countries from highest to lowest as follows: Kosovo, Albania, Serbia, Montenegro, North Macedonia, Bosnia and Herzegovina. Despite being a relatively new country with a smaller population, Kosovo has been ahead of other countries in terms of digital society policy.

For future studies, the number of criteria and alternatives can be increased for more comprehensive analysis, and actual data can be incorporated into the analysis as it becomes available. In addition, correlation between digital society ranking results and gross domestic product (GDP) per capita can be considered for further studies.

As technology develops, there will be an increasing need for taking new actions and determining strategic policies considering society in terms of digitalization. Last but not least, the need for research in the field of digital society will gradually increase in the coming decades.

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