Original Article

Applying multi-criteria decision aiding methods to the process of selecting a host city for sporting event

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Abstract:

Various decision-making problems that occur in the process of sporting event management can be formulated as multi-criteria issues and solved by appropriate methods. One of them is choosing the best, the most suitable host city for sporting event. On the one hand, organising such an event, especially a large one, is considered as an opportunity for the hosting area, both the city and the country. In addition to image promotion, integrating people, increasing the sport culture and recognition on an international stage, it provides many economic benefits, for instance increased employment, additional tourist income, trade boost and direct investments leading to urban development. On the other hand, hosting a sporting event is a huge and costly undertaking. Thus, countries and cities wishing to do that have to prove that they are well qualified to be a host. In the location selection process the following factors may be considered: economy and finance, infrastructure, safety and security, experience with sporting events, access and lodging, environment and meteorology, and many others. Bearing that in mind as well as some controversial decisions from the past, for example those regarding the choice of Russia and Qatar to host the 2018 and 2022 Football World Cups, it is extremely important to select the host city properly, in the most transparent and effective way possible. To do that, multi-criteria decision aiding methods can be used. The goal of this article is to carry out a simulation of the host city selection decision, using multi-criteria outranking techniques, based on the 20th edition of the World Athletics Championships, which are scheduled to be held in 2025.

KeyWords: *hosting-right, techno-economic criteria, MCDA, PROMETHEE IIv, EXPROM IIv, modified ELECTRE III*

Introduction

Since organizing and implementing sporting events includes a number of complex procedures (Cardoso et al., 2006), sporting event management is inseparable from decision-making, specifically from multi-criteria decision-making, as many event-related issues require choosing the best, i.e. the most suited alternative from a set of available options, considering a number of vital factors (criteria) when comparing them. This is mainly because of organizers' decisions. In addition to defining and developing event objectives, strategies and tactics, they are, for instance, related to the event budget, host city and venue selection, supplier selection, sponsor, broadcast and media solicitation as well as hiring, training and firing of event staff (Supovitz & Goldwater, 2013). Moreover, experience learns that frequently either there is more than one solution to a specific decision-making problem, or its complexity is so high that it goes beyond the capacity of a human mind (Kiaffas & Afthinos, 2013). In addition, contemporary sporting event management must respond to the growing ecological awareness of society and the pressure of institutions responsible for shaping human-natural relations (Białkowski, 2017). Besides, if we are dealing with international sporting events, whose network nature is connected with organizational links between cities, sports associations, the media, sponsors and other stakeholders, all procedures become even more difficult and complex (Majewska, 2019). Therefore, to make a sporting event a success, appropriate decision-making needs to be made, starting from hosting-right, going through the opening ceremony, and ending up with the event's finishing phase, while at the same time taking into account that decision-maker may be either an individual or a group of people (Babatunde & Ighravwe, 2019).

According to the outcomes of various studies (see Russo & Rosen, 1975; Montgomery & Svenson, 1989; Larichev, 1992; Payne et al., 1993; Korhonen et al., 1997), multi-criteria decision-making problems pose a serious challenge for people, and the more criteria the problem comprises, the more complicated it is (Ashikhmin & Furems, 2005). There are a few approaches dealing with this type of problems, for instance: multi-attribute utility theory (MAUT) (see Keeney & Raiffa, 1976), outranking relation approach (see Roy, 1990), verbal decision analysis (VDA) (see Larichev & Moshkovich, 1995, 1997), and the MACBETH method (see Bana e Costa & Vansnick, 1997; Bana e Costa & Chagas, 2004). Furthermore, in order to determine a synthetic

performance index (single variable) for many individual aspects (various variables), Taxonomic Measure of Development introduced by Hellwig (1968) or Pattern Normalization proposed by Müller-Frączek (2019) may be used.

The purpose of this article is to apply 3 multi-criteria outranking methods, namely EXPROM II with veto threshold (Górecka, 2014, 2015; Górecka & Szałucka, 2013), PROMETHEE II with veto threshold (Górecka, 2013, 2014; Górecka & Muszyńska, 2011; Górecka & Pietrzak, 2012), and modified ELECTRE III (Górecka, 2009), to the problem of the host city selection. The paper will demonstrate the usefulness of the above-mentioned techniques with a real-life example of 2025 *World Athletics Championships*. The framework presented in the paper uses economic and financial as well as technical criteria such as accommodation, healthcare, climate and meteorology or infrastructure. This framework can be used for other sporting events to make the host city selection process rational and transparent for all concerned. Since there are not many publications on this subject (Karaca et al., 2019; Babatunde & Ighravwe, 2019), the paper will contribute to filling the gap in the literature.

Material & methods

The current study shows the application of multi-criteria decision aiding methods in the sporting event location assessment process. It is based on the example of the 2025 World Athletics Championships, organized by World Athletics (formerly IAAF – International Association of Athletics Federations). The World Championships – the jewel in the crown of the World Athletics’ global competition programme – is a biennial athletics competition, the third largest sporting event in the world (after Olympic Games and FIFA World Cup), engaging athletes from up to 212 nations competing for 49 gold medals, and watched by billions of TV viewers all around the world (World Athletics, <https://www.worldathletics.org/hosting/iaaf-events/world-athletics-championships>, 25.02.2020)

Many countries in Africa, namely Algeria, Egypt, Kenya, Morocco, Nigeria, and South Africa, as well as one in Australia and Oceania, namely Australia, have already expressed an interest to host the event. Thus, 7 locations were considered in the analysis: Alger (Algeria), Cairo (Egypt), Nairobi (Kenya), Rabat (Morocco), Abuja (Nigeria), Durban (South Africa), and Gold Coast (Australia).

Evaluation criteria (variables) were identified through the literature review and based on World Athletics’ expectations as well as on information about bidding processes for different sporting events. The location’s attractiveness, its potential – including its country – to host, organise and stage successful World Athletics Championships in 2025, is measured through the 8 major dimensions (general criteria), which are represented by the selected 30 variables (secondary criteria). Table 1 presents the 30 indicators (variables) reflecting the 8 dimensions of the model, along with their specifications.

Table 1. Location potential evaluation factors – dimensions, measures, units and indicator descriptions

Dimension	Measures, units and indicator descriptions
Host city (easy access and lodging, ability to attract and to host people)	4-star and 5-star hotels (number of hotels in the city according to HotelsCombined, https://www.hotelscombined.com/ , 25.02.2020)
	Accommodation facilities (number of facilities in the city according to HotelsCombined, https://www.hotelscombined.com/ , 25.02.2020)
	Catering facilities (number of facilities in the city according to TripAdvisor, https://www.tripadvisor.com/ , 25.02.2020)
	Travel & Tourism Competitiveness Index (TTCI) 2019 edition (score 1-7 (best), World Economic Forum (WEF), https://reports.weforum.org/travel-and-tourism-competitiveness-report-2019/country-profiles/ , 25.02.2020) The Travel and Tourism Competitiveness Index (TTCI) is made by the World Economic Forum (https://www.weforum.org/reports/the-travel-tourism-competitiveness-report-2019 , 25.02.2020). It is published biennially and benchmarks the T&T competitiveness of 140 economies. The index is comprised of 4 sub-indexes, 14 pillars and 90 individual indicators, distributed among the different pillars.
	Perception Index (PI) The idea of Perception Index (PI) is based on Quality of Life Index produced by Numbeo (https://www.numbeo.com/quality-of-life/rankings.jsp , 22.02.2020). It is calculated in accordance with the following formula: $\text{Perception Index (PI)} = \max(0, 100 - \text{CostOfLivingIndex} / 10 + \text{SafetyIndex} / 2 + \text{HealthIndex} / 2.5 - \text{TrafficTimeIndex} / 2 - \text{PollutionIndex} * 2/3 + \text{ClimateIndex} / 3)$
Finance (ability to finance sporting event)	GDP per capita (US\$, Coface, https://www.coface-usa.com/Economic-studies , 25.02.2020)
	GDP growth (%, 2020 (forecast), Coface, https://www.coface-usa.com/Economic-studies , 25.02.2020)
	Public debt (% GDP, 2020 (forecast), Coface, https://www.coface-usa.com/Economic-studies , 25.02.2020)

Country risk (threat assessment, average credit risk on a country's businesses, likelihood of a risk caused by political events)	Country risk assessment (scale A1, A2, A3, A4, B, C, D and E transformed into scale 1-8 (best), Coface, https://www.coface-usa.com/Economic-studies , 25.02.2020))
	Political Risk Medium/Long Term (scale 1-7 (worst), Credendo, https://www.credendo.com/country-risk , 25.02.2020)
	Political Violence Risk (scale 1-7 (worst), Credendo, https://www.credendo.com/country-risk , 25.02.2020)
Healthcare (ability to provide a health care system adapted to the needs of the World Athletics Championships whilst ensuring that the normal healthcare operations are not affected)	Health Care Index for Countries (scale 0-100 (best), Numbeo, https://www.numbeo.com/health-care/rankings_by_country.jsp , 21.02.2020)
	Best Healthcare In The World 2020, overall efficiency – index (value 0-1 (best), WHO, www.who.int/healthinfo/paper30.pdf , 25.02.2020, World Population Review, http://worldpopulationreview.com/countries/best-healthcare-in-the-world/ , 25.02.2020) WHO overall health system performance depends on 5 factors: health, i.e. disability-adjusted life expectancy (overall or average - 25%, distribution or equality - 25%), responsiveness (overall or average - 12.5%, distribution or equality - 12.5%), fair financial contribution (distribution or equality - 25%).
Sports experience (organisational capacity and the quality of the technical expertise available)	Global Sports Impact (GSI) Cities Index, 2019 (Sportcal, https://www.sportcal.com/GSI/GSICitiesIndex , 25.02.2020) The GSI Nations and Cities Index is based on an in-depth analysis of almost 700 major multi-sport games and world championships over a rolling 14-year period, covering 7 years in the past and 7 years in the future. It incorporates more than 80 sports in order to identify which cities and nations are bidding for and winning the right to host global sporting events.
	Experience with Athletics Sporting Events 2016-2020 (number of international athletics sporting events organized from 2016 to 2020)
Fans and audience (ability to provide an active audience, ability to attract local attendees)	City population 2020 (number of people living in a city according to World Population Review, http://worldpopulationreview.com/world-cities/ , 25.02.2020)
	GNI per capita, PPP, 2017 (current international \$, The World Bank, https://databank.worldbank.org/reports.aspx?source=world-development-indicators , 25.02.2020)
	Purchasing Power Index (Numbeo, https://www.numbeo.com/quality-of-life/rankings.jsp , 22.02.2020)
	Place in all-time medal table (country's place in all-time medal table after the 2019 World Athletics Championships)
	Doha 2019 - points in placing table (points earned by the country during the 2019 World Athletics Championships in Doha, World Athletics, https://www.worldathletics.org/competitions/world-athletics-championships/iaaf-world-athletics-championships-doha-2019-6033/placingtable , 25.02.2020)
	Popularity of athletics (popularity of athletics in a given country, scale 0-5 (most popular), Topend Sports, https://www.topendsports.com/world/countries/index.htm , 25.02.2020)
Environment and meteorology (ability to provide appropriate climate and environmental conditions for athletes and supporters)	PM2.5 air pollution, mean annual exposure by country (micrograms per cubic meter, The World Bank, https://databank.worldbank.org/reports.aspx?source=world-development-indicators , 25.02.2020)
	Environmental Performance Index (EPI) 2018 - ranking score (EPI, https://epi.envirocenter.yale.edu/ , 25.02.2020) The 2018 Environmental Performance Index (EPI) ranks 180 countries on 24 performance indicators across 10 issue categories covering environmental health and ecosystem vitality.
	Average temperature in September - deviation from 15°C (°C, Weather Atlas, https://www.weather-atlas.com/en/climate , 15.02.2020)
	Normal precipitation (mm, Weather Atlas, https://www.weather-atlas.com/en/climate , 15.02.2020)
	Number of wet days (days, Weather Atlas, https://www.weather-atlas.com/en/climate , 15.02.2020)
	Relative humidity (scale from -3 to 2 (very comfortable), ClimaTemps.com, https://www.climatemps.com/ , 15.02.2020)
	Global Competitiveness Index - Infrastructure (1-7 (best), World Economic Forum http://reports.weforum.org/global-competitiveness-index-2017-2018/ , 15.02.2020)
Infrastructure (ability to provide efficient transport and telecommunications systems)	Global Competitiveness Index - Technological readiness ((1-7 (best), World Economic Forum, http://reports.weforum.org/global-competitiveness-index-2017-2018/ , 15.02.2020)
	Logistics performance index: overall score (scale 1=low to 5=high, The World Bank, https://lpi.worldbank.org/ , 15.02.2020)

In order to rank locations from the most to the least suitable one from the perspective of sporting event location, the EXPROM II method with veto threshold (Górecka, 2014, 2015; Górecka & Szałucka, 2013; cf. Diakoulaki and Koumoutsos, 1991) was first used. The method is based on the concept of ideal and anti-ideal

solutions and, thus, it enables ranking options in a cardinal scale, which is desirable from the point of view of comparing the alternatives considered. Moreover, thanks to the introduction of the veto threshold, EXPROM II is partially compensatory, which means that a very bad score on one criterion cannot be offset by even a very good score on other(s) (Górecka & Szałucka, 2013; Chojnacka & Górecka, 2018).

Another advantage of EXPROM II and also the reason why it was used was because it is user-friendly, i.e. simple and understandable. Its steps are neither very complex nor computationally demanding and, thus, they can be (and they actually were) performed in a spreadsheet and quite easily explained to the decision-maker(s). Furthermore, this technique enables obtaining a complete pre-order of the options to which the points are assigned. Final solution in this form is considered as being convenient and convincing for the potential users of MCDA methods (Górecka & Szałucka, 2013; Chojnacka & Górecka, 2018).

In order to examine the influence of changes in the weighting coefficients for evaluation criteria on the final rankings of locations, 3 different vectors of weights were determined. The first (I) and the second (II) ones were created with the help of Hokkanen & Salminen's approach, version 1 and 2 (Hokkanen & Salminen, 1994, 1997) respectively. In the third vector (III) all measures were considered equally important. The model of preferences for the decision-making problem, containing the weights and the values of indifference (q), preference (p) and veto (v) thresholds, is shown in Table 2.

Table 2. Model of preferences

Measure	Max /min	Weighting coefficients			q	p	v
		I	II	III			
4-star and 5-star hotels	max	0.026	0.031	0.033	3	8	60
Accommodation facilities	max	0.026	0.031	0.033	100	300	2000
Catering facilities	max	0.052	0.063	0.033	200	600	5000
Travel & Tourism Competitiveness Index	max	0.052	0.063	0.033	0.5	1.5	6
Perception Index	max	0.052	0.063	0.033	5	10	100
GDP per capita	max	0.083	0.080	0.033	1000	5000	50000
GDP growth	max	0.042	0.040	0.033	0.5	1.5	8
Public debt	min	0.083	0.080	0.033	5	10	50
Country risk assessment	min	0.056	0.050	0.033	1	2	7
Political Risk Medium/Long Term	min	0.056	0.050	0.033	1	2	6
Political Violence Risk	min	0.056	0.050	0.033	1	2	6
Health Care Index for Countries	max	0.063	0.050	0.033	5	10	80
Best Healthcare In The World 2020, overall efficiency - index	max	0.063	0.050	0.033	0.05	0.15	0.8
Global Sports Impact (GSI) Cities Index	max	0.028	0.038	0.033	500	1000	20000
Experience with Athletics Sporting Events 2016-2020	max	0.028	0.038	0.033	0	2	10
City population 2020	max	0.014	0.019	0.033	200000	1000000	25000000
GNI per capita, PPP	max	0.007	0.009	0.033	1000	5000	50000
Purchasing Power Index	max	0.007	0.009	0.033	10	30	100
Place in all-time medal table	min	0.007	0.009	0.033	2	5	150
Doha 2019 - points in placing table	max	0.007	0.009	0.033	15	40	400
Popularity of athletics	max	0.014	0.019	0.033	0	2	5
PM2.5 air pollution	min	0.007	0.003	0.033	2	5	50
EPI ranking score	max	0.007	0.003	0.033	3	6	80
Average temperature	min	0.014	0.006	0.033	0	2	10
Normal precipitation	min	0.007	0.003	0.033	5	10	250
Wet days	min	0.007	0.003	0.033	1	3	20
Relative humidity	max	0.014	0.006	0.033	0	2	6
Global Competitiveness Index - Infrastructure	max	0.042	0.042	0.033	0.5	1.5	7
Global Competitiveness Index - Technological Readiness	max	0.042	0.042	0.033	0.5	1.5	7
Logistics Performance Index	max	0.042	0.042	0.033	0.5	1.5	5

Results

Table 3 presents the final results (rankings) received in a spreadsheet using the EXPROM II technique with veto threshold and 3 different vectors of weights. The higher the value of the net outranking flow, the better the assessment of the location from the point of view of hosting-rights.

Table 3. Results obtained by EXPROM II method with 3 different vectors of weighting coefficients

N o .	EXPROM II with veto threshold					
	Weighting coefficients I		Weighting coefficients II		Weighting coefficients III	
	Location	Net flow	Location	Net flow	Location	Net flow
1	Australia (Gold Coast)	0.937	Australia (Gold Coast)	0.926	Australia (Gold Coast)	0.858
2	Kenya (Nairobi)	-0.010	Kenya (Nairobi)	-0.011	Kenya (Nairobi)	0.185
3	Morocco (Rabat)	-0.082	Morocco (Rabat)	-0.082	Egypt (Cairo)	-0.092
4	South Africa (Durban)	-0.095	South Africa (Durban)	-0.092	Morocco (Rabat)	-0.096
5	Egypt (Cairo)	-0.120	Egypt (Cairo)	-0.107	South Africa (Durban)	-0.116
6	Algeria (Alger)	-0.305	Nigeria (Abuja)	-0.313	Algeria (Alger)	-0.350
7	Nigeria (Abuja)	-0.325	Algeria (Alger)	-0.321	Nigeria (Abuja)	-0.389

The rankings provided in Table 3 show that the results are sensitive to the changes in the parameters of the model of preferences as the modifications of the values of weights caused some alterations in the ordering of locations.

Despite the fact that the rankings received are not fully compatible, it is possible to determine, on the one hand, the location which is the best as the host city for World Athletics Championships in 2025 (Gold Coast in Australia), and on the other hand, the set of locations which are not appropriate for this event (Abuja in Nigeria, Alger in Algeria, Cairo in Egypt, Durban in South Africa, and Rabat in Morocco). Nairobi in Kenya may be classified as 'contentious' because in 1 case its final score (value of net outranking flow) is positive, and in 2 cases – negative.

In order to examine the influence of the choice of method on the final rankings of the locations, 2 other outranking techniques, namely PROMETHEE II with veto threshold (Górecka, 2013, 2014; Górecka & Muszyńska, 2011; Górecka & Pietrzak, 2012) and the modified ELECTRE III method (Górecka, 2009), were used. The solutions received with their help are shown in Tables 4 and 5 respectively. In both cases 3 previously mentioned vectors of weights were employed to demonstrate the impact of changes in the values of weighting coefficients for evaluation criteria on the final rankings of locations considered.

Table 4. Results obtained by PROMETHEE II method with 3 different vectors of weighting coefficients

N o .	PROMETHEE II with veto threshold					
	Weighting coefficients I		Weighting coefficients II		Weighting coefficients III	
	Location	Net flow	Location	Net flow	Location	Net flow
1	Australia (Gold Coast)	0.773	Australia (Gold Coast)	0.755	Australia (Gold Coast)	0.662
2	Kenya (Nairobi)	0.010	Kenya (Nairobi)	0.012	Kenya (Nairobi)	0.168
3	South Africa (Durban)	-0.041	South Africa (Durban)	-0.037	South Africa (Durban)	-0.045
4	Morocco (Rabat)	-0.069	Morocco (Rabat)	-0.071	Morocco (Rabat)	-0.066
5	Egypt (Cairo)	-0.120	Egypt (Cairo)	-0.107	Egypt (Cairo)	-0.092
6	Algeria (Alger)	-0.258	Algeria (Alger)	-0.270	Algeria (Alger)	-0.268
7	Nigeria (Abuja)	-0.295	Nigeria (Abuja)	-0.282	Nigeria (Abuja)	-0.358

It is noteworthy that, once again, the rankings yielded are not in total agreement. Nevertheless, they do not differ much from each other. Therefore, it is possible to determine the location which is the most suitable for hosting the 2025 edition of World Athletics Championships (Gold Coast in Australia), the locations which are quite good (Nairobi in Kenya in the case of the PROMETHEE II method with veto threshold¹; Nairobi in Kenya and Rabat in Morocco in the case of the modified ELECTRE III method²), and the set of locations which are the least suitable and should not be considered for organization of this event (Abuja in Nigeria, Alger in Algeria, Cairo in Egypt, Durban in South Africa, and Rabat in Morocco in the case of the PROMETHEE II method with veto threshold³; Abuja in Nigeria, Alger in Algeria, and Cairo in Egypt in the case of the modified ELECTRE III method⁴).

¹The values of net outranking flows determined for them are in all cases positive.

²The differences between the number of locations outranked by them and the number of locations that outranks them are in all cases non-negative.

³The values of net outranking flows determined for them are in all cases negative.

⁴The differences between the number of locations outranked by them and the number of locations that outranks them are in all cases negative. Durban in South Africa can be named as quite bad since the differences between the number of locations outranked by it and the number of locations that outranks it are non-positive.

Table 5. Results obtained by modified ELECTRE III method with 3 different vectors of weighting coefficients

No.	Modified ELECTRE III					
	Weighting coefficients I		Weighting coefficients II		Weighting coefficients III	
	Location	Score	Location	Score	Location	Score
1	Australia (Gold Cost)	6	Australia (Gold Cost)	6	Australia (Gold Cost)	6
2	Kenya (Nairobi)	2	Kenya (Nairobi)	1	Kenya (Nairobi)	3
3	Morocco (Rabat)	0	Morocco (Rabat)	0	Morocco (Rabat)	1
4	Egypt (Cairo)	-1	South Africa (Durban)	0	Egypt (Cairo)	-1
5	South Africa (Durban)	-1	Egypt (Cairo)	-1	South Africa (Durban)	-1
6	Nigeria (Abuja)	-2	Nigeria (Abuja)	-2	Algeria (Alger)	-3
7	Algeria (Alger)	-4	Algeria (Alger)	-4	Nigeria (Abuja)	-5

Moreover, it should be emphasised that results received using 3 different MCDA methods are alike. This statement can be confirmed by the values of Spearman rank correlation coefficients shown in Table 6. These values, calculated independently for each of 3 vectors of weighting coefficients considered in the research, indicate the existence of strong positive associations between the ranks locations obtained in different orderings.

Table 6. Spearman rank correlation coefficients

Weighting coefficients I			
Method	EXPROM IIv	PROMETHEE IIv	Modified ELECTRE III
EXPROM IIv	1.0000	0.9643	0.9554
PROMETHEE IIv	0.9643	1.0000	0.9018
Modified ELECTRE III	0.9554	0.9018	1.0000
Weighting coefficients II			
Method	EXPROM IIv	PROMETHEE IIv	Modified ELECTRE III
EXPROM IIv	1.0000	0.9286	0.9911
PROMETHEE IIv	0.9286	1.0000	0.9554
Modified ELECTRE III	0.9911	0.9554	1.0000
Weighting coefficients III			
Method	EXPROM IIv	PROMETHEE IIv	Modified ELECTRE III
EXPROM IIv	1.0000	0.8571	0.9375
PROMETHEE IIv	0.8571	1.0000	0.9375
Modified ELECTRE III	0.9375	0.9375	1.0000

In summary, the analysis conducted has revealed that the solutions received are quite robust to changes in the values of the parameters of the preference model (the weights of evaluation criteria to be exact). It has also demonstrated that the rankings of the locations are not sensitive to selection of the decision-aiding method.

In view of all the results obtained and the whole analysis performed, the most suited location for hosting 2025 World Athletics Championships turned out to be Gold Coast in Australia. It is the most preferred location according to all 3 decision-aiding methods, regardless of the vector of weighting coefficients used. Another location that can be considered – allowing for all the results of the research conducted – is Nairobi in Kenya, which is the second-most preferred city according to all 3 techniques, regardless of the weights placed upon the evaluation criteria. This location can be tempting since in 2017 Nairobi hosted successfully the IAAF World Under-18 Championships, attracting record crowds. The attendance in events held in Africa has always been top, which is particularly important in the context of the 2019 Championships in Doha (Qatar), which were held in empty stands.

Discussion

Taking into account that the host city selection problem requires a systematic approach, a reliable framework for assessing the applicant cities has been presented in this article. It describes the utilization of 3 MCDA outranking methods, which are regarded as user-friendly ones, namely EXPROM IIv, PROMETHEE IIv, and the modified ELECTRE III, in choosing a location for 2025 World Athletics Championships. There are several competing cities (7) and many conflicting criteria (30) that should be considered in selecting the most suitable one. MCDA methods are viable tools allowing for improving the decision-making processes. They can help decision-makers to take thoroughly thought-out and responsible decisions: by using 3 aforementioned techniques it is possible to choose the best location in a rational, transparent, free of suspected corruption way, which can be examined and understood by all stakeholders. Thus, this article may contribute to making trustworthy and confident location decisions for sporting events, which is extremely vital, especially in the context of some past hosting-right decisions that were questioned and/or did not work out well, for instance awarding the World Athletics Championships 2019 to Doha in Qatar.

Conclusions

The scientific framework presented in the article can be used in the case of different sporting events all over the world. Moreover, it can be adapted to other (non-sporting) events, for instance trade fairs, shows, concerts, exhibitions, festivals, workshops or conferences. MCDA outranking methods used within the proposed framework can refine the evaluation process and make decision-making more efficient as their assumptions are consistent with reality. Nevertheless, we must not forget that the results of the analysis are heavily dependent on the dimensions and measures that are used within it. Hence, they should certainly be tailored to each case's specific conditions.

References:

- Ashikhmin, I., & Furems, E. (2005). UniCombOS – Intelligent Decision Support System for Multi-criteria Comparison and Choice. *Journal of Multi-criteria Decision Analysis*, 13, 147-157.
- Babatunde, S. O., & Ighravwe, D. E. (2019). A fuzzy multi-criteria approach for hosting-right selection: A case study of sport event. *International Journal of Data and Network Science*, 3(2019), 1-12.
- Bana e Costa, C. A., & Chagas, M. P. (2004). A career choice problem: an example of how to use MACBETH to build a quantitative value model based on qualitative value judgments. *European Journal of Operational Research*, 153, 323-331.
- Bana e Costa, C. A., & Vansnick, J. C. (1997). Applications of the MACBETH approach in the framework of the additive-aggregation model. *Journal of Multi-Criteria Decision Analysis*, 6, 107-114.
- Białkowski, C. (2017). The Organizing of FIS Nordic Ski World Championships Lahti 2017 in the Context of ISO 20121:2012 Standard (in Polish). *Quality in Sport*, 3(3), 42-53.
- Cardoso, J., Mendling, J., Neumann, G., & Reijers, H. (2006). A Discourse on Complexity of Process Models. In: Eder, J., & Dustdar, S. (eds.). *Proceedings of BPM Workshops, Lecture Notes in Computer Science*, 4103, Springer-Verlag, 115-126.
- Chojnacka, E., & Górecka, D. (2018). Ranking charities using Multi Actor Multi Criteria Analysis methodology: the case of Public Benefit Organizations in Poland. In: Macharis, C., & Baudry, G. (eds.). *Decision-making for sustainable transport and mobility: Multi Actor Multi Criteria Analysis*, Edward Elgar Publishing, Cheltenham, UK, Northampton, MA, USA, 211-231.
- Diakoulaki, D., & Koumoutsos, N. (1991). Cardinal ranking of alternative actions: extension of the PROMETHEE method. *European Journal of Operational Research*, 53, 337-47.
- Górecka, D. (2009). *Multi-criteria selection aiding of European projects* (in Polish), TNOiK „Dom Organizatora”, Toruń.
- Górecka, D. (2013). Applying Multi-Criteria Decision Aiding techniques in the process of project management within the wedding planning business. *Operations Research and Decisions*, 22(4/2012), 41-67.
- Górecka, D. (2014). PROMETHEE methods (in Polish). In: Trzaskalik, T. (ed.). *Wielokryterialne wspomaganie decyzji. Metody zastosowania*, PWE, Warszawa, 110-125.
- Górecka, D. (2015). Using multi-criteria methods in the process of applying for international AACSB accreditation (in Polish). In: Gajda, J.B., & Jadcak, R. (eds.). *Badania operacyjne. Przykłady zastosowań*, Wydawnictwo Uniwersytetu Łódzkiego, Łódź, 69-88.
- Górecka, D., & Muszyńska, J. (2011). Spatial analysis of the innovation of Polish regions (in Polish), *Acta Universitatis Lodzianensis. Folia Oeconomica*, 253, 55-70.
- Górecka, D., & Pietrzak, M.B. (2012). Application of PROMETHEE II in the European projects' ranking process within the Regional Operational Programme for Kujawsko-Pomorskie Voivodeship for the years 2007-2013 (in Polish). *Studia Ekonomiczne, Modelowanie Preferencji a Ryzyko*, 12, *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, 83-103.
- Górecka, D., & Szałucka, M. (2013). Country market selection in international expansion using multicriteria decision aiding methods. *Multiple Criteria Decision Making*, 8, 31-55.
- Hellwig, Z. (1968). Application of the Taxonomic Method to the Countries Typology According to their Level of Development and the Structure of Resources and Qualified Staff (in Polish). *Przegląd Statystyczny*, 4, 307-326.
- Hokkanen, J., & Salminen, P. (1994). The Choice of a Solid Waste Management System by Using the ELECTRE III Decision-aid Method. In: Paruccini, M. (ed.). *Applying Multiple Criteria Aid for Decision to Environmental Management*, Kluwer Academic Publishers, Dordrecht, 111-153.
- Hokkanen, J., & Salminen, P. (1997). Choosing a Solid Waste Management System Using Multicriteria Decision Analysis. *European Journal of Operational Research*, 98(1), 19-36.
- Karaca, C., Ulutaş, A., Yamaner, G., & Topal, A. (2019). The selection of the best Olympic place for Turkey using an integrated MCDM model. *Decision Science Letters*, 8(1), 1-16.
- Keeney, R. L., & Raiffa, H. (1976). *Decisions with Multiple Objectives: Preferences and Value Tradeoffs*. Wiley, New York.
- Kiaffas, Z. G., & Afthinos, Y. D. (2013). Simulations for Correct Organizational Decision Making Processes in Sport Events Project Production Management. *Hellenic Journal of Sports & Recreation Management*, 10(1), 2-15.

- Korhonen, P., Larichev, O., Moshkovich, H., Mechitov, A., & Wallenius, J. (1997). Choice behavior in a computer-aided multiattribute decision task. *Journal of Multi-Criteria Decision Analysis*, 6, 233-246.
- Larichev, O.I. (1992). Cognitive validity in design of decision-aiding technique. *Journal of Multi-Criteria Decision Analysis*, 1(3), 127-138.
- Larichev, O. I., & Moshkovich, H. M. (1995). ZAPROS-LM – A method and system for ordering multi-attribute alternatives. *European Journal of Operational Research*, 82, 503-521.
- Larichev, O. I., & Moshkovich, H. M. (1997). *Verbal Decision Analysis for Unstructured Problems*. Kluwer Academic Publishers, Berlin.
- Majewska, B. (2019). An international network sporting event based on the example of the Four Hills Tournament. *Quality in Sport*, 3(5), 22-33.
- Montgomery, H., & Svenson, O. (1989). A think-aloud study of dominance structuring in decision processes. In: Montgomery, H., & Svenson, O. (eds.). *Process and Structure on Human Decision Making*, Wiley, Chichester, 135-150.
- Müller-Frączek, I. (2019). Pattern normalization: a new tool for dynamic comparisons. *Statistika*, 99(2), 182-197.
- Payne, J. W., Bettman, J. R., Coupey, E., & Johnson, E. J. (1993). A constructive process view of decision making: multiple strategies in judgment and choice. In: Huber, O., Mumpower, J., van der Pligt, J., & Koele, P. (eds.). *Current Themes in Psychological Decision Research*, North Holland, Amsterdam, 107-142.
- Roy, B. (1990). *Multi-criteria decision aiding* (in Polish), Wydawnictwa Naukowo-Techniczne, Warszawa.
- Russo, J. E., & Rosen, L. D. (1975). An eye fixation analysis of multi-attribute choice. *Memory and Cognition*, 3, 267-276.
- Supovitz, F., & Goldwater, R. (2013). *The Sports Event Management and Marketing Playbook*, Wiley, Hoboken, N.J.
- ClimaTemps.com, <https://www.climatemps.com/> (access: 15.02.2020).
- Coface, <https://www.coface-usa.com/Economic-studies> (access: 25.02.2020).
- Credendo, <https://www.credendo.com/country-risk> (access: 25.02.2020).
- EPI, <https://epi.envirocenter.yale.edu/> (access: 25.02.2020).
- HotelsCombined, <https://www.hotelscombined.com/> (access: 25.02.2020).
- Numbeo, <https://www.numbeo.com/common/> (access: 21-22.02.2020).
- Sportcal, <https://www.sportcal.com/> (access: 25.02.2020).
- The World Bank, <https://data.worldbank.org/> (access: 15.02, 25.02.2020).
- Topend Sports, <https://www.topendsports.com/world/countries/index.htm> (access: 25.02.2020).
- TripAdvisor, <https://www.tripadvisor.com/> (access: 25.02.2020).
- Weather Atlas, <https://www.weather-atlas.com/en/climate> (access: 15.02.2020).
- WHO, www.who.int/healthinfo/paper30.pdf (access: 25.02.2020).
- World Athletics, <https://www.worldathletics.org/> (access: 25.02.2020).
- World Economic Forum, <https://www.weforum.org/> (access: 15.02., 25.02.2020).
- World Population Review, <http://worldpopulationreview.com/countries/best-healthcare-in-the-world/> (access: 25.02.2020).