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A NOVEL IMF SWARA-FDWGA-PESTEL ANALYSIS FOR ASSESSMENT OF HEALTHCARE SYSTEM

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Abstract: *Decision-making represents a very popular field with many developed approaches. However, still exists the need for the creation of novel integrated models such as well is the case in this paper. The novel integrated Improved Fuzzy Stepwise Weight Assessment Ratio Analysis (IMF SWARA) method, Fuzzy Dombi weighted geometric averaging (FDWGA) operator and PESTEL (P-Political, E-Economic, S-Social, T-Technological, E-Environmental, L-Legal) model has been developed. Five decision-makers (DMs) have evaluated six main elements of the PESTEL analysis and 30 elements more (five for each group). In total, we have created 35 models based on the developed model. Results of PESTEL analysis based on IMF SWARA method and FDWGA shows that legal and economic factors represent the most significant parameters, while last placed belong environmental group. Also, the usefulness of the developed integrated model has been demonstrated.*

Key words: *IMF SWARA, Fuzzy Dombi operator, PESTEL, decision-making, FDWGA operator*

1. Introduction

Consideration of the problem of decision-making in the presence of a number of influential factors has become an extremely important area. Methods, techniques, approaches that belong to the field of multicriteria decision making (MCDM) (Alosta et al. 2021; Yildirim et al. 2022; Pamučar and Savin, 2020) become very popular and applicable in all fields of both science and profession (Mahmutagić et al. 2021; Karagoz et al. 2021; Stanujkić et al. 2021; Švadlenka et al. 2020; Shekhovtsov et al. 2021; Özdağoğlu et al. 2021). They have practically become an indispensable tool for

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efficient management of any system, thanks to their very flexible performance If we add to that the possibility of making decisions in different conditions of uncertainty (Ali et. al. 2021; Mishra et al. 2021; Bausys et al. 2021; Stanujkić et al. 2021) then it is clear why this is one of the most developed areas of operational research in the last 10-15 years. In addition to a large number of newly developed MCDM methods, the development of different aggregators is being pursued in parallel (Yang et al. 2020; Vojinović et al. 2021; Debnath, 2021) which contribute to decision-making in more precise way. Another very flexible feature of MCDM methods is the easy way to integrate with other approaches (Blagojević et al. 2020; Ali et al. 2021; Khan, 2018; Wang et. al. 2020Another very flexible feature of MCDM methods is the easy way to integrate with other approaches in order to overcome potential difficulties and make more precise decisions.

The aim of this paper is to create an original integrated IMF SWARA-FDWGA-PESTEL model in order to enable accurate quantification of PESTEL analysis. In this way, soft analysis becomes precise with clear quantified values that make decision-making easier.

The IMF SWARA method was developed last year and has been successfully applied in several studies so far. Stević et. al. (2022) have created an objective critique of the application of the fuzzy SWARA method by proving the applicability and advantages of the IMF SWARA methodSeven different studies have been investigated to prove the validity of the IMF SWARA method. Damjanović et. al. (2022) have created the original DEA (Data Envelopment Analysis) – IMF SWARA – MARCOS (Measurement of alternatives and ranking according to COmpromise solution) model for determination level of traffic safety in Montenegro in interval of 23 years. IMF SWARA was applied in all six scenarios for determining the weighting coefficients of the criteria. Zolfani et al. (2021) have applied an integrated MCDM model in which they used IMF SWARA method for computing criteria weights for the evaluation of logistics villages in Turkey. Vojinović and Stević, (2021) have just applied the combination of IMF SWARA and PESTEL for health system analysis. They defined six main elements of PESTEL analysis and five sub-criteria for each of the main groups. Vojinović et al. (2021) have also applied the IMF SWARA method to determine the importance of criteria in the evaluation of companies engaged in the transport of dangerous goods. Part of the criteria has been referred to the legal aspect, which is extremely important for the proper functioning of this area. When it comes to Dombi operator, a number of approaches have been developed including various fuzzy forms: picture fuzzy Dombi (Jana et al. 2019), spherical fuzzy Dombi (Ashraf et al. 2020), pythagorean fuzzy Dombi (Khan et al. 2019), intuitionistic fuzzy Dombi (Seikh and Mandal, 2021) etc. The combination of PESTEL analysis and MCDM methodology is rare. (Tsangas et al. 2019) have combined SWOT (Strengths, Weakness, Opportunities, Threats) with PESTEL and AHP (Analytic Hierarchy Process) for assessment hydrocarbons sector in Cyprus.

Throughout the rest of the paper, the algorithms of the applied methodology are presented, the PESTEL analysis is set, and the results are presented, along with the presentation of the calculation of individual steps. A discussion of the results and concluding remarks were presented.

2. Methods

2.1. IMF SWARA method

IMF SWARA method has been represented first time by Vrtagić et al. (2021). Algorithm of IMF SWARA method can be represented through the next steps:

Step 1: Arrangement of criteria in descending order based on their expected significance.

Step 2: Starting from the previously determined rank, the relatively smaller significance of the criterion (criterion C_j) was determined in relation $\overline{\kappa_j}$ to the previous one (Cj_{-1}), and this was repeated for each subsequent criterion. TFN scale for assessment of criteria using IMF SWARA is shown in Table 1.

Table 1. Linguistics and the TFN scale for application of IMF SWARA method

Linguistic Variable	Abbreviation	TFN Scale
Absolutely less significant	ALS	(1,1,1)
Dominantly less significant	DLS	(0.5,0.667,1)
Much less significant	MLS	(0.4,0.5,0.667)
Really less significant	RLS	(0.333,0.4,0.5)
Less significant	LS	(0.286,0.333,0.4)
Moderately less significant	MDLS	(0.25,0.286,0.333)
Weakly less significant	WLS	(0.222,0.25,0.286)
Equally significant	ES	(0,0,0)

Step 3: Calculation the fuzzy coefficient $\overline{\partial_j}$ (1):

$$\overline{\partial_j} = \begin{cases} \bar{1} & j = 1 \\ \overline{\kappa_j} & j > 1 \end{cases} \tag{1}$$

Step 4: Calculation the weights $\overline{\ell_j}$ (2):

$$\overline{\ell_j} = \begin{cases} \bar{1} & j = 1 \\ \dfrac{\overline{\ell_{j-1}}}{\overline{\partial_j}} & j > 1 \end{cases} \tag{2}$$

Step 5: Calculation of the fuzzy weight coefficients (3):

$$\overline{w_j} = \frac{\overline{\ell_j}}{\sum_{j=1}^{m} \overline{\ell_j}} \tag{3}$$

where w_j is the fuzzy relative weight of the criteria j, and m denotes the total number of criteria.

2.2. Fuzzy Dombi operator

FDWGA is represented by equations (4) and (5) based on changing and modification of the previously developed approach RNDWGA (Sremac et al. 2018), which implies the application of fuzzy instead rough numbers.

$$FDWGA\left(\overline{\wp}\right)=\left(\wp_j^l,\wp_j^m,\wp_j^u\right)=\begin{cases}\wp_j^l=\dfrac{\sum_{j=1}^{n}\left(\wp_j^l\right)}{1+\left\{\sum_{j=1}^{n}w_j\left(\dfrac{1-f\left(\wp_j^l\right)}{f\left(\wp_j^l\right)}\right)^{\rho}\right\}^{1/\rho}}\\ \wp_{ij}^m=\dfrac{\sum_{j=1}^{n}\left(\wp_j^m\right)}{1+\left\{\sum_{j=1}^{n}w_j\left(\dfrac{1-f\left(\wp_j^m\right)}{f\left(\wp_j^m\right)}\right)^{\rho}\right\}^{1/\rho}}\\ \wp_{ij}^u=\dfrac{\sum_{j=1}^{n}\left(\wp_j^u\right)}{1+\left\{\sum_{j=1}^{n}w_j\left(\dfrac{1-f\left(\wp_j^u\right)}{f\left(\wp_j^u\right)}\right)^{\rho}\right\}^{1/\rho}}\end{cases} \tag{4}$$

where w_j denotes weights of s decision makers participating in the research, while $p\geq 0$ is non-negative number, $\wp_j^l$ - low value of TFN, $\wp_j^m$ - middle value of TFN and $\wp_j^u$ - upper values of TFN.

$$f\left(\wp_j^l,\wp_j^m,\wp_j^u\right)=\begin{cases}f\left(\wp_j^l\right)=\dfrac{\left(\wp_j^l\right)}{\sum_{j=1}^{n}\left(\wp_j^l\right)}\\ f\left(\wp_j^m\right)=\dfrac{\left(\wp_j^m\right)}{\sum_{j=1}^{n}\left(\wp_j^m\right)}\\ f\left(\wp_j^u\right)=\dfrac{\left(\wp_j^u\right)}{\sum_{j=1}^{n}\left(\wp_j^u\right)}\end{cases} \tag{5}$$

3. PESTEL analysis

In this study has been reproduced PESTEL (political, economic, socio-cultural, technological, environmental and legal factors) analysis from the paper (Vojinović and Stević, 2021). PESTEL analysis of the healthcare system of the local community

of Pale with reference to the emergency situation caused by the COVID-19 pandemic consist of 30 parameters and has been shown as follow. Performing such analysis is very important because according to Đukić, (2020) pandemic impact of coronavirus (COVID-19) on human health can shutter international investment and the business environment. In addition to the economic crisis, a pandemic has influence on crisis of health systems, which requires huge economic investments (Đukić et al. 2021).

Political factors – P

*P*1 – *Political instability*

*P*2 – *Corruption and political influence in the healthcare system*

*P*3 – *Organization, insurance and comprehensiveness of health care*

*P*4 – *Social and healthcare policy of the executive*

*P*5 – *Healthcare quality and safety policy*

Economic factors – E

*E*1 – *Healthcare financing system*

*E*2 – *Population living standard*

*E*3 – *Investing in healthcare improvement*

*E*4 – *Economic crises (national and international)*

*E*5 – *Healthcare service prices*

Social factors – S

*S*1 – *Education, healthcare habits and lifestyle of the population*

*S*2 – *Age of the population*

*S*3 – *Demographic changes and migrations*

*S*4 – *Social health care*

*S*5 – *Public opinion and the media in health promotion*

Technological factors – T

*T*1 – *Application of technology in the diagnosis and treatment of diseases*

*T*2 – *Negative impact of technology on health (mobile telephony, Internet, social networks)*

*T*3 – *Development and application of new medicines and methods in the treatment of diseases*

*T*4 – *Automation of records of healthcare users and diseases*

*T*5 – *Electronic communication in accessing health care and providing information about health hazards and measures taken*

Environmental factors – EN

*EN*1 – *Healthy environment*

*EN*2 – *Competitiveness of the public and private health sector*

*EN*3 – *Education, training and expertise of healthcare professionals*

*EN*4 – *Population awareness of the importance of health and self – care*

*EN*5 – *Population healthcare and health improvement projects*

Legal factors – L

L1 – Legal and institutional framework of health care

L2 – Healthcare quality control

L3 – Legal protection of users of healthcare services

L4 – Implementation and application of international legal norms

L5 – The role and activity of national and international regulatory bodies

4. Application of novel IMF SWARA-FDWGA-PESTEL MODEL

In this part of the paper has been demonstrated the application of a novel IMF SWARA-FDWGA-PESTEL model based on the preferences of five decision-makers (DMs). As the first we have created five various IMF SWARA models for the main factors of the PESTEL analysis. After that has been formed five similar models for each main parameter, so in total have been created 35 IMF SWARA models. IMF SWARA models with all elements calculated using equations (1) – (3) for five DMs for the main parameters of the PESTEL analysis have shown in Tables 2, 3, 4, 5, and 6.

Table 2. IMF SWARA of the main factors of PESTEL analysis (DM1)

	DM1	$\overline{\kappa_j}$	$\overline{\partial_j}$	$\overline{1_j}$	$\overline{w_j}$
C2	E		(1,1,1)	(1,1,1)	(0.234,0.243,0.255)
C3	D	(0,0,0)	(1,1,1)	(1,1,1)	(0.234,0.243,0.255)
C1	PO	(0.222,0.25,0.286)	(1.222,1.25,1.286)	(0.778,0.8,0.818)	(0.182,0.194,0.208)
C6	PR	(0.286,0.333,0.4)	(1.286,1.333,1.4)	(0.556,0.6,0.636)	(0.13,0.146,0.162)
C5	O	(0.333,0.4,0.5)	(1.333,1.4,1.5)	(0.37,0.429,0.477)	(0.087,0.104,0.122)
C4	T	(0.4,0.5,0.667)	(1.4,1.5,1.667)	(0.222,0.286,0.341)	(0.052,0.069,0.087)
			SUM	(3.926,4.114,4.273)	

Table 3. IMF SWARA of the main factors of PESTEL analysis (DM2)

	DM2	$\overline{\kappa_j}$	$\overline{\partial_j}$	$\overline{1_j}$	$\overline{w_j}$
C6	PR		(1,1,1)	(1,1,1)	(0.233,0.242,0.254)
C4	T	(0,0,0)	(1,1,1)	(1,1,1)	(0.233,0.242,0.254)
C2	E	(0.222,0.25,0.286)	(1.222,1.25,1.286)	(0.778,0.8,0.818)	(0.181,0.194,0.207)
C1	PO	(0.25,0.286,0.333)	(1.25,1.286,1.333)	(0.583,0.622,0.655)	(0.136,0.151,0.166)
C3	D	(0.333,0.4,0.5)	(1.333,1.4,1.5)	(0.389,0.444,0.491)	(0.091,0.108,0.124)
C5	O	(0.5,0.667,1)	(1.5,1.667,2)	(0.194,0.267,0.327)	(0.045,0.065,0.083)
				(3.944,4.133,4.291)	

Table 4. IMF SWARA of the main factors of PESTEL analysis (DM3)

	DM3	$\overline{\kappa_j}$	$\overline{\partial_j}$	$\overline{1_j}$	$\overline{w_j}$
C6	PR		(1,1,1)	(1,1,1)	(0.251,0.265,0.284)
C1	PO	(0.222,0.25,0.286)	(1.222,1.25,1.286)	(0.778,0.8,0.818)	(0.196,0.212,0.233)
C2	E	(0,0,0)	(1,1,1)	(0.778,0.8,0.818)	(0.196,0.212,0.233)
C3	D	(0.333,0.4,0.5)	(1.333,1.4,1.5)	(0.519,0.571,0.614)	(0.13,0.152,0.174)
C5	O	(0.5,0.667,1)	(1.5,1.667,2)	(0.259,0.343,0.409)	(0.065,0.091,0.116)
C4	T	(0.286,0.333,0.4)	(1.286,1.333,1.4)	(0.185,0.257,0.318)	(0.047,0.068,0.09)
				(3.519,3.771,3.977)	

Table 5. IMF SWARA of the main factors of PESTEL analysis (DM4)

	DM4	$\overline{\kappa_j}$	$\overline{\partial_j}$	$\overline{1_j}$	$\overline{w_j}$
C3	D	(0,0,0)	(1,1,1)	(1,1,1)	(0.23,0.238,0.248)
C6	PR	(0,0,0)	(1,1,1)	(1,1,1)	(0.23,0.238,0.248)
C4	T	(0.222,0.25,0.286)	(1.222,1.25,1.286)	(0.778,0.8,0.818)	(0.179,0.19,0.203)
C5	O	(0.286,0.333,0.4)	(1.286,1.333,1.4)	(0.556,0.6,0.636)	(0.128,0.143,0.158)
C2	E	(0.25,0.286,0.333)	(1.25,1.286,1.333)	(0.417,0.467,0.509)	(0.096,0.111,0.126)
C1	PO	(0.333,0.4,0.5)	(1.333,1.4,1.5)	(0.278,0.333,0.382)	(0.064,0.079,0.095)
				(4.028,4.2,4.345)	

Table 6. IMF SWARA of the main factors of PESTEL analysis (DM5)

	DM5	$\overline{\kappa_j}$	$\overline{\partial_j}$	$\overline{1_j}$	$\overline{w_j}$
C1	PO	(0,0,0)	(1,1,1)	(1,1,1)	(0.236,0.243,0.251)
C2	E	(0,0,0)	(1,1,1)	(1,1,1)	(0.236,0.243,0.251)
C6	PR	(0.222,0.25,0.286)	(1.222,1.25,1.286)	(0.778,0.8,0.818)	(0.184,0.194,0.205)
C4	T	(0.25,0.286,0.333)	(1.25,1.286,1.333)	(0.583,0.622,0.655)	(0.138,0.151,0.164)
C5	O	(0.286,0.333,0.4)	(1.286,1.333,1.4)	(0.417,0.467,0.509)	(0.098,0.113,0.128)
C3	D	(1,1,1)	(2,2,2)	(0.208,0.233,0.255)	(0.049,0.057,0.064)
				(3.986,4.122,4.236)	

The next step represents the application of FDWGA operator using equations (4) and (5) in order to aggregate previously obtained criteria weights by IMF SWARA method. It is important to note that the weight w_j of each DMs is equal i.e 0.200.

Example of the application of FDWGA operstor for the first PESTEL main parameter is as follows.

$$FDWGA\left(\overline{\wp}\right)=\left(\wp_j^l,\wp_j^m,\wp_j^u\right)=\begin{cases}\wp_j^l=\dfrac{\sum_{j=1}^{n}\left(\wp_j^l\right)}{1+\left\{\sum_{j=1}^{n}w_j\left(\dfrac{1-f\left(\wp_j^l\right)}{f\left(\wp_j^l\right)}\right)^{\rho}\right\}^{1/\rho}}=\dfrac{0.814}{1+\left(0.2\times\dfrac{1-0.224}{0.224}\right)+\left(0.2\times\dfrac{1-0.167}{0.167}\right)+\left(0.2\times\dfrac{1-0.241}{0.241}\right)+\left(0.2\times\dfrac{1-0.079}{0.079}\right)+\left(0.2\times\dfrac{1-0.290}{0.290}\right)}=0.132\\ \wp_{ij}^m=\dfrac{\sum_{j=1}^{n}\left(\wp_j^m\right)}{1+\left\{\sum_{j=1}^{n}w_j\left(\dfrac{1-f\left(\wp_j^m\right)}{f\left(\wp_j^m\right)}\right)^{\rho}\right\}^{1/\rho}}=\dfrac{0.879}{1+\left(0.2\times\dfrac{1-0.221}{0.221}\right)+\left(0.2\times\dfrac{1-0.172}{0.172}\right)+\left(0.2\times\dfrac{1-0.241}{0.241}\right)+\left(0.2\times\dfrac{1-0.090}{0.090}\right)+\left(0.2\times\dfrac{1-0.276}{0.276}\right)}=0.151\\ \wp_{ij}^u=\dfrac{\sum_{j=1}^{n}\left(\wp_j^u\right)}{1+\left\{\sum_{j=1}^{n}w_j\left(\dfrac{1-f\left(\wp_j^u\right)}{f\left(\wp_j^u\right)}\right)^{\rho}\right\}^{1/\rho}}=\dfrac{0.953}{1+\left(0.2\times\dfrac{1-0.218}{0.218}\right)+\left(0.2\times\dfrac{1-0.174}{0.174}\right)+\left(0.2\times\dfrac{1-0.244}{0.244}\right)+\left(0.2\times\dfrac{1-0.100}{0.100}\right)+\left(0.2\times\dfrac{1-0.263}{0.263}\right)}=0.169\end{cases}$$

In the same way have been obtained the other main parameters of the PESTEL analysis and consequently all subparameters. After applying IMF SWARA – FDWGA – PESTEL model fuzzy weights for the main parameters is shown in Figure 1.

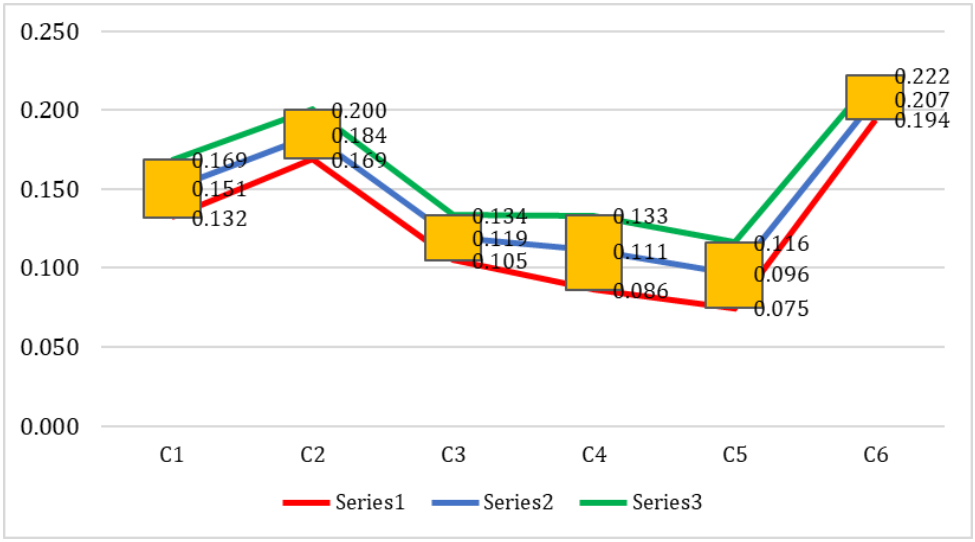

Figure 1. Weights of the main parameters of PESTEL analysis

Figure 1 shows fuzzy weights of the main parameters of PESTEL analysis. Red color denotes low value of TFN, blue middle and green upper value of TFN. The most important parameter is the legal group with value of:

$$w_1 = (0.085, 0.102, 0.118), \quad w_6 = (0.194, 0.207, 0.222)$$

The results obtained according to previously described steps of IMF SWARA – FDWGA – PESTEL model that denotes fuzzy values of subelements have been shown in Table 7.

Table 7. Overall results of importance of PESTEL analysis for each group after application of IMF SWARA – FDWGA model

w_j	TFN	w_j	TFN	w_j	TFN
w_{11}	(0.085,0.102,0.118)	w_{21}	(0.215,0.227,0.239)	w_{31}	(0.23,0.245,0.261)
w_{12}	(0.203,0.217,0.232)	w_{22}	(0.184,0.207,0.226)	w_{32}	(0.15,0.171,0.192)
w_{13}	(0.181,0.201,0.221)	w_{23}	(0.192,0.207,0.222)	w_{33}	(0.089,0.108,0.126)
w_{14}	(0.162,0.185,0.205)	w_{24}	(0.092,0.11,0.127)	w_{34}	(0.275,0.285,0.297)
w_{15}	(0.195,0.21,0.226)	w_{25}	(0.16,0.178,0.195)	w_{35}	(0.134,0.153,0.172)
w_j	TFN	w_j	TFN	w_j	TFN
w_{41}	(0.273,0.282,0.294)	w_{51}	(0.193,0.206,0.22)	w_{61}	(0.245,0.253,0.264)
w_{42}	(0.089,0.115,0.138)	w_{52}	(0.087,0.101,0.113)	w_{62}	(0.259,0.266,0.276)
w_{43}	(0.204,0.219,0.234)	w_{53}	(0.263,0.269,0.278)	w_{63}	(0.206,0.218,0.232)
w_{44}	(0.117,0.138,0.156)	w_{54}	(0.212,0.225,0.238)	w_{64}	(0.114,0.134,0.152)
w_{45}	(0.138,0.158,0.177)	w_{55}	(0.122,0.141,0.158)	w_{65}	(0.09,0.109,0.126)

Final results have been obtained multiplication of values represented in Figure 1 (the main parameters of PESTEL analysis) and values of subcriteria represented in Table 7. These final results have been shown in Table 8.

Table 8. Final results of importance of PESTEL analysis after application of IMF SWARA – FDWGA model

w_j	TFN	w_j	TFN	w_j	TFN
w_{11}	(0.011,0.015,0.02)	w_{21}	(0.036,0.042,0.048)	w_{31}	(0.024,0.029,0.035)
w_{12}	(0.027,0.033,0.039)	w_{22}	(0.031,0.038,0.045)	w_{32}	(0.016,0.02,0.026)
w_{13}	(0.024,0.03,0.037)	w_{23}	(0.033,0.038,0.045)	w_{33}	(0.009,0.013,0.017)
w_{14}	(0.021,0.028,0.035)	w_{24}	(0.015,0.02,0.025)	w_{34}	(0.029,0.034,0.04)
w_{15}	(0.026,0.032,0.038)	w_{25}	(0.027,0.033,0.039)	w_{35}	(0.014,0.018,0.023)
w_j	TFN	w_j	TFN	w_j	TFN
w_{41}	(0.024,0.031,0.039)	w_{51}	(0.014,0.02,0.026)	w_{61}	(0.048,0.053,0.059)
w_{42}	(0.008,0.013,0.018)	w_{52}	(0.006,0.01,0.013)	w_{62}	(0.05,0.055,0.061)
w_{43}	(0.018,0.024,0.031)	w_{53}	(0.02,0.026,0.032)	w_{63}	(0.04,0.045,0.051)
w_{44}	(0.01,0.015,0.021)	w_{54}	(0.016,0.022,0.028)	w_{64}	(0.022,0.028,0.034)
w_{45}	(0.012,0.018,0.024)	w_{55}	(0.009,0.014,0.018)	w_{65}	(0.017,0.023,0.028)

According to calculated results shown in Table 8, it can be concluded that legal (w_{62}, w_{61}, and w_{63}) and economic factors (w_{21}, w_{23}, and w_{22}) are the most significant within the PESTEL analysis with values of (0.05,0.055,0.061), (0.048,0.053,0.059), (0.04,0.045,0.051), (0.036,0.042,0.048), (0.033,0.038,0.045), and (0.033,0.038,0.045), respectively. Least significant factors are , w_{33}, w_{42}, and w_{52} with values (0.009,0.013,0.017), (0.008,0.013,0.018), and (0.006,0.01,0.013) respectively.

Conclusion

Quality and adequate functioning of healthcare systems are not only medical question, because depends on economic factors, environment, legal factors, political events, organization of the healthcare system, and others. For that reason we have implemented a novel integrated IMF SWARA-FDWGA-PESTEL model in this important field to can observe the real and current state of healthcare system taking into account political, economic, socio-cultural, technological, environmental, and legal factors. Strengths of the developed integrated model can be manifested through the possibility of its application in any area which considers various parameters and various solutions.

Results of PESTEL analysis based on IMF SWARA method and FDWGA shows that legal and economic factors represent the most significant parameters, while last placed belong environmental group. The contribution of the performed study can be observed from the following aspects: quantification of the PESTEL analysis, it is possible to find out how important and influential these factors are in the current situation in the healthcare system. Also, integration of PESTEL analysis with the IMF SWARA – FDWGA with PESTEL has been performed for the first time in the literature. Future research can be related to defining appropriate strategies for

management of this healthcare system and developing a novel MCDM model for their evaluation.

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