



Proceedings of the
1st Virtual International Conference
Path to a Knowledge Society-
Managing Risks and Innovation

Editors:
Stanković, M. and Nikolić, V.

Publishers:
Research and Development Center
"ALFATEC", Niš, Serbia
Complex System Research Center, Niš, Serbia

December 09-10, 2019



Editors
Stanković, M.
Nikolić, V.

PaKSoM 2019

1st Virtual International Conference
Path to a Knowledge Society-Managing Risks and
Innovation
Proceedings

Publishers
Research and Development Center “IRC ALFATEC”, Niš, Serbia
Complex System Research Centre, Niš, Serbia

Serbia, Niš, December 09-10, 2019



Proceedings of
1st Virtual International Conference
Path to a Knowledge Society-Managing Risks and Innovation

Serbia, Niš, December 09-10, 2019

Editors:

Prof. Dr. Miomir Stanković and Prof. Dr. Vesna Nikolić

Technical Editor:

Dr. Lazar Z. Velimirović

Published by:

Research and Development Center "IRC ALFATEC", Niš, Serbia, and
Complex System Research Centre, Niš, Serbia

Printed by:

Blue Copy, Niš, Serbia

Number of copies printed: 100

The publishing year: 2019

Printing of this edition has been financially supported by
Serbian Ministry of Education, Science and Technological Development

ISBN 978-86-80616-05-6

CIP - Каталогizacija u publikaciji
Narodna biblioteka Srbije, Beograd

005.94(082)(0.034.2)

005.591.6(082)(0.034.2)

VIRTUAL international conference Path to a knowledge society-managing risks and innovation
PaKSoM 2019 (1 ; 2019 ; Niš)

Proceedings [Elektronski izvor] / 1st Virtual international conference Path to a knowledge
society-managing risks and innovation PaKSoM 2019, Serbia, Niš, December 09-10, 2019 ;
[organizer] Research and development Center "IRC ALFATEC" ; editors Stanković, M.
Nikolić, V. - Niš : Research and development center "IRC ALFATEC" : Complex system research
centre, 2020 (Niš : Blue copy). - tekst, slika, 1 elektronski optički disk (CD-ROM) ; 12 cm

Tiraž 100. - Bibliografija uz svaki rad.

ISBN 978-86-80616-05-6 (IRCA)

a) Знање -- Менаџмент -- Зборници б) Предузећа -- Пословање -- Иновације -- Зборници

COBISS.SR-ID 283184140

PaKSoM 2019

1st Virtual International Conference Path to a Knowledge Society-Managing Risks and Innovation

Organizer:

Research and Development Center “IRC ALFATEC”

Co-organizers:

- Mathematical Institute of the Serbian Academy of Sciences and Arts
- Complex System Research Centre

Supported by:

Serbian Ministry of Education, Science and Technological Development



Program Committee

Chair:

Prof. Dr. Miomir Stanković,

Faculty of Occupational Safety, Serbia

Members:

Prof. Dr. Zoran Stajić,

Faculty of Electronic Engineering, Serbia

Dr. Vesna Nikolić,

Faculty of Occupational Safety, Serbia

Dr. Lazar Velimirović,

Mathematical Institute of the Serbian Academy of Sciences and Arts, Serbia

Dr. Hui-Ju Wang,

Fo Guang University, Taiwan

Dr. Jane Pauković,

Faculty of Management Zaječar, Serbia

Dr. Bojan Srđević,

Faculty of Agriculture, Serbia

Dr. Goran Janačković,

Faculty of Occupational Safety, Serbia

Dr. Daniel Riofrio,

Universidad San Francisco de Quito, Ecuador

Prof. Dr. Aleksandar Janjić,

Faculty of Electronic Engineering, Serbia

Dr. Radomir Stanković,

Mathematical Institute of the Serbian Academy of Sciences and Arts, Serbia

Dr. Tomasz Janowski,

Gdańsk University of Technology, Poland

Dr. Gabrijela Popović,

Faculty of Management Zaječar, Serbia

Dr. Maja Đurović,

Faculty of Mechanical Engineering, Serbia

Dr. Wolfgang Eixelsberger,

Carinthia University of Applied Sciences, Austria

Dr. Marko Serafimov,

Faculty of Mechanical Engineering, North Macedonia

Dr. Detelin Markov,

Faculty of Power Engineering and Power Machines, Bulgaria

Dr. Miroslava Marić,

Faculty of Management Zaječar, Serbia

Dr. Mileta Janjić,

Faculty of Mechanical Engineering, Montenegro

Dr. Milena Stanković,

Faculty of Electronic Engineering, Serbia

Dr. Charles K. Ayo,

Covenant University, Nigeria

Dr. Alexopoulos Charalampos,

University of the Aegean, Greece

Organizing Committee

Chair:

Prof. Dr. Zoran Stajić,

Faculty of Electronic Engineering, Serbia

Members:

Dr. Lazar Velimirović,

Mathematical Institute of the Serbian Academy of Sciences and Arts, Serbia

Dr. Petar Vranić,

Mathematical Institute of the Serbian Academy of Science and Arts, Serbia

M.Sc. Ljubiša Stajić,

Research and Development Center “IRC ALFATEC”, Serbia

M.Sc. Radmila Janković,

Mathematical Institute of the Serbian Academy of Science and Arts, Serbia

M.Sc. Jelena Velimirović,

Mathematical Institute of the Serbian Academy of Sciences and Arts, Serbia

M.Sc. Biserka Mijucić,

Research and Development Center “IRC ALFATEC”, Serbia

M.Sc. Ivana Velickovska,

Mathematical Institute of the Serbian Academy of Sciences and Arts, Serbia

Table of Contents

Processes, Examples and Experiences in Applying Kaizen Management Concept in Serbia	3
Bratimir Nešić, Dejan Vasović, Luka Nešić, Ljubiša Stajić	
Innovative Applications of Quantum Theory in New Evolving Notions of Order in Management and Economics: Some Reflections in Honor of David Bohm ...	11
Milan B. Vemić	
Resolving the Local-global Paradox in Business Organizations.....	21
Gennady Shkliarevsky	
The Role of Commercial Law in the Conduct of Business	27
Siniša Franjić	
The Effects of Innovation on the Competitiveness of Southeast European Countries	35
Marija Radulović	
The Impact of Oil Price Change on the GDP of OPEC Countries	39
Zoltán Szira, Hani Alghamdi, Erika Varga	
E-learning: Analysis, Advantages and Disadvantages	45
Nenad Perić	
The Influence of Personality Traits on Teamwork Performance	51
Bojana Jokanović	
The Genesis of Innovation in the Italian Innovative SMEs	57
Pietro Pavone	
Key Factors in Innovation Strategy Choice: The Evidence from Serbia	65
Ljiljana Kontić	
Prepping for the Future: Reinvention of the Education System	71
Miloš Dobrojević	
Types of Innovation and Their Impact on ICT Use in Companies in the Republic of North Macedonia	77
Milena Boskoska Klisaroski, Marija Midovska Petkoska	

HR Management in Innovation-supportive Organizational Systems	85
Ivana Marinović Matović	
Challenges of Development of Innovative Sector of Republic of Serbia	93
Maja Đurović Petrović, Jasmina Lozanović Šajić	
Circular Entrepreneurship – Towards Responsible Enterprise	97
Ilie Margareta, Ilie Constantin, Duhnea Cristina, Antohi Ionut	
Application of Different Methods for Distance Estimation	103
Milan Pavlović, Ivan Ćirić, Miloš Simonović, Vlastimir Nikolić	
Using the Weighted Sum Preferred Levels of Performances in House Selection	109
Gabrijela Popović	
Higher Education for Sustainable Development Goals	115
Geetika Sood	
An Overview of Sustainable Competitiveness Composite Indices	119
Andrea Okanović, Jelena Ješić, Simonida Vukadinović	
New Approach To Innovation Policy	125
Milan Stamatović, Aleksandar Jovičić, Ljubiša Stamatović	
Entrepreneurship and Economic Performance: Evidences from Selected OIC Countries	131
Mohsen Mohammadi Khyareh	
Gamification as an Innovative Approach in Security Systems	137
Željko Đ. Bjelajac, Aleksandar M. Filipović	
Innovative Strategy Entrepreneurial Management	143
Anđelija Radonjić, Biljana Ilic, Vidoje Stefanović	
The Impact Factor of Education on the Public Sector and International Controlled Transactions	151
Constantinos Challoumis	
Employer Branding as an HR Tool for Talent Management – Case Study Serbian Y generation	161
Tatjana Mamula Nikolić, Mirjana Nećak	

The Importance of Technological and Industrial Innovation for Achieving Competitiveness of Domestic Enterprises	169
Mihalj Bakator, Dragan Čočkalo, Dejan Đorđević, Edit Terek, Miloš Vorkapić	
The Realm of Sustainability of Business Models	175
Pooja Sharma, Nitin Pathak	
Possibilities for Quadruple Helix Model Approach in an Inclusive Regional Innovation Systems	181
Jelena Ješić, Andrea Okanović, Andrea Andrejević Panić	
Utilization Management of Waste Glycerol Obtained in Rapeseed Oil-based Biodiesel Production	187
Jovan Ćirić, Nikola Stanković, Marko Živković, Đorđe Lazarević	
E-banking and Fintech Companies' Services in Customers' Perception	191
Silvia Ghiță-Mitrescu, Cristina Duhnea, Andreea-Daniela Moraru, Margareta Ilie	
Automatic Rule-based Kitchen Layout Design	199
Petar Pejić, Miodrag Mikić, Jelena Milovanović	
Determination of the Adapted Leadership Grid	205
Vuk Mirčetić	
Impact of Competitiveness on Economic Growth (Case Study of WEF Countries)	211
Mohsen Mohammadi Khyareh, Nasrin Rostami	
Analysis of the Performance of Knowledge Management in Serbian Public Services	213
Borislav Kolarić	
Individual and Policy Mix Effects of Regional and National R&D Subsidies on the Cooperative Behavior of Spanish Manufacturing Firms	215
Dragana Radičić, Geoff Pugh, Mehtap Hisarciklilar-Riegler	
Social Media and Community: From an Observer to a Participant	217
Tamara Vučenović	
Deploying Artificial Intelligence Imagery Analysis for Creative Work	219
Stefan Cremer, Claudia Loebbecke	

Answer for Innovative Entrepreneurial Reasoning Lies within Quantum Physics?221

Slobodan Adžić

Entrepreneurship and Economic Growth: the Mediation Role of Access to Finance223

Mohsen Mohammadi Khyareh, Hossein Torabi

Dimension of Leadership in the Concept of “Smart” Cities in Serbia225

Marija Todorović Vasilčić

Using the Weighted Sum Preferred Levels of Performances in House Selection

Gabrijela Popović¹

¹Faculty of Management in Zaječar, Park šuma Kraljevica bb, 19000 Zaječar, Serbia

¹gabrijela.popovic@fmz.edu.rs

Abstract—The selection of a house for purchasing represents a very important decision that influences the quality of the future life of a customer. Various dimensions expressed through different criteria impact the final choice of the house. The Multiple-Criteria Decision-Making (MCDM) methods provide a possibility of involving of all criteria influencing the particular decision. The main intention of this paper is to propose the Weighted Sum Preferred Levels of Performances (WS PLP method) as a useful tool that will contribute to increasing the reliability of the performed selection. The applicability of the proposed methodology is demonstrated through the real case study that involves 5 houses in 5 different parts of the city of Zaječar that are evaluated against 9 criteria. The obtained results confirmed that the given method increases the reliability and enables the making of appropriate decisions.

Keywords – MCDM, WS PLP method, Entropy method, house selection, Zaječar

I. INTRODUCTION

The selection of a house for living represents a very important decision for a customer. The particular house should comply with the different requirements of the future owner. These requirements sometimes could be conflict because satisfying one of them goes at the expense of others. The MCDM methods could contribute to successfully overcoming this problem.

In recent years, the MCDM methods have become very popular for the facilitation of the decision-making process and their popularity still grows. Until now, many different MCDM methods are proposed. The comprehensive overview of developed MCDM methods could be found in the papers of many eminent authors [1-3]. Also, these methods are used for resolving different real-world problems [4-6].

In this case, we propose the application of the WS PLP method [7] for the selection of house for purchasing. The case of the application of the MCDM methods in house selection was, also, observed by the authors [8-11]. We assessed 5 houses in Zaječar against the 9 evaluation criteria. With the main aim of presenting the applicability of the given method, the rest of the paper is organized as follows: in section II the methodology is explained; section III contains the numerical example; that is followed by the conclusion.

II. METHODOLOGY

The selection of the optimal house is performed by applying the Entropy method [12] for determining the criteria significance and the WS PLP method for ranking of alternatives and final selection [7]. The WS PLP method is based on the earlier developed Simple Additive Weight (SAW) or Weighted Sum (WS) methods [13-14]. The WS PLP method makes a distinction between the best alternative and that one which has the best matching with the decision-maker's (hereinafter marked as DM) preferred performance ratings (*ppr* values). In that way, the DM knows what alternative is the best from all and which is in accordance with expressed requirements. In some cases, one alternative has a good ranking position because some criteria have extremely good performances while others could be quietly unsatisfying. The WS PLP method that clearly indicates and this is its main advantage relative to the other MCDM methods.

The calculation procedure used in this paper can precisely be presented through the following steps:

Step 1. Select the set of the representative criteria and form decision matrix X as follows:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{12} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}, \quad (1)$$

where x_{ij} represents the performance rating of the alternative i with respect to the criterion j , m denotes the number of the alternatives and n the number of the criteria.

Step 2. Determine the criteria weights. In the present case, we use the Entropy method [12]. The main reason for this relies in the fact that the Entropy method could be considered as very objective. Determining of the criteria weights is performed by using the following equation:

$$w_j = \frac{1 - e_j}{\sum_{j=1}^n (1 - e_j)}, \quad (2)$$

where $j = 1, \dots, n$.

The output entropy e_j of the j_{th} factor is calculated as:

$$e_j = -\frac{1}{\ln(m)} \sum_{j=1}^n r_{ij} \ln(r_{ij}), \quad (3)$$

where $j = 1, \dots, n$.

The term: $\sum_{j=1}^n w_j = 1$, should be fulfilled.

Step 3. Define the *ppr* values for all criteria. The *ppr* values are determined according to the DM's preferences, which represent the elements of the virtual alternative $A_0 = \{x_{01}, x_{02}, \dots, x_{0n}\}$. If the *ppr* value of any criterion is not determined by the DM, then it is determined as follows:

$$x_{0j} = \begin{cases} \max_i x_{ij} & | j \in \Omega_{\max} \\ \min_i x_{ij} & | j \in \Omega_{\min} \end{cases}, \quad (4)$$

where x_{0j} represents the optimal *ppr* of the criterion j ; Ω_{\max} is set of benefit and Ω_{\min} is set of cost criteria.

Step 4. Form the normalized decision matrix. Stanujkic et al. [15] proposed the normalization procedure that enables DMs to express their preferences for the *ppr* more effectively. That is done by using the following (5) and (8):

$$r_{ij} = \frac{x_{ij} - x_j^*}{x_j^+ - x_j^-}; j \in \Omega_{\max}, \text{ and} \quad (5)$$

$$r_{ij} = \frac{x_j^* - x_{ij}}{x_j^+ - x_j^-}; j \in \Omega_{\min}, \quad (6)$$

where r_{ij} denotes the normalized performance rating of the alternative i with respect to the criterion j , x_j^* is the *ppr* value of the criterion j , and x_j^+ and x_j^- are the largest and the smallest performance ratings of the criterion j , respectively.

Step 5. Calculate the overall performance ratings for all alternatives in the following way:

$$S_i = \sum_{j=1}^n w_j \cdot r_{ij}, \quad (7)$$

where S_i denotes the overall performance rating of the alternative i , and $S_i \in [0, 1]$.

The calculations should be continued through the following steps in the case when the overall performance ratings for two or more alternatives satisfying the condition: $S_i > 0$. Otherwise, the alternative with the largest S_i is optimal, and the ranking is performed in ascending order.

Step 6. Calculate the compensation coefficient for all alternatives that fulfill the term: $S_i > 0$, as follows:

$$c_i = \lambda d_i^{\max} + (1 - \lambda) \bar{S}_i^+, \quad (8)$$

where:

$$d_i^{\max} = \max_i d_i = \max_i r_{ij} w_j, \quad (9)$$

$$\bar{S}_i^+ = \frac{S_i^+}{n_i^+}, \quad (10)$$

where d_i^{\max} is the maximum weighted normalized distance of the alternative i relative to the ppr values of all the criteria so that $r_{ij} > 0$, \bar{S}_i^+ denotes the average performance ratings obtained on the basis of the criteria so that $r_{ij} > 0$, n_i^+ is the number of the criteria of the alternative i so that $r_{ij} > 0$, λ is the coefficient ($\lambda = [0,1]$) and is usually set at 0.5.

Step 7. Compute the adjusted performance rating for all the alternatives in which $S_i > 0$ in the following way:

$$S'_i = \sum_{j=1}^n w_j r_{ij} - \gamma c_i, \quad (11)$$

where S'_i denotes the adjusted overall performance rating of the alternative i , c_i represents the compensation coefficient ($c_i > 0$), and γ is the coefficient ($\gamma = [0,1]$).

Step 8. Rank the considered alternatives and select the most appropriate one. The alternative with the highest S'_i value is the most appropriate and the ranking is performed in ascending order.

III. CASE STUDY

In this section, the application of the proposed methodology pointed to the selection of the optimal house for purchase in Zaječar is presented. The alternative houses are located in different parts of Zaječar which are presented in Tab. 1.

TABLE I. THE LOCATION OF THE CONSIDERED HOUSES

Alternative	Part of the city
A_1	Podliv
A_2	City center
A_3	Ključ
A_4	Šljivarski put
A_5	Beli breg

The set of the evaluation criteria relies on that one presented in the paper of Li [16]. For the needs of this paper, the given set is slightly modified and adjusted for the application in this particular case. The main dimensions and evaluation criteria are presented in Tab. 2.

TABLE II. EVALUATION CRITERIA [16]

Dimensions	Criteria		Measure
Transportation network	C_1	Transportation connection	Grade from 1 to 5
	C_2	Proximity to work	Grade from 1 to 5
Neighborhood infrastructure	C_3	Landscape	Grade from 1 to 5
	C_4	Education and healthcare facilities	Grade from 1 to 5
Community environment	C_5	Security	Grade from 1 to 5
	C_6	Population density	Grade from 1 to 5
House attributes	C_7	Size	m ²
	C_8	Age	year
	C_9	Value	€

As can be seen from Tab. 2, we take into account 9 evaluation criteria that cover 4 dimensions important for a house customer. The estimation of the houses against the first 6 criteria will be expressed over grades from 1 to 5 (1 as the worst grade and 5 as the best). Besides, this list of criteria is not the ultimate; depending on the needs, a greater number of criteria could be included.

The demonstration of the proposed methodology is based on the data regarding the houses in Zaječar taken from the website of a real-estate agency (<http://nekretnine-zajecar.co.rs/>). It is presumed that one customer (in further text marked as DM) is interested in

the purchase of the house in Zaječar. There are 5 houses in 5 different parts of the city that satisfies his requirements. First, by using (2) and (3), the weights of criteria are determined. Besides the defined criteria weights and all input data, Tab. 3 contains the *ppr* values that show the desired values of the considered criteria according to the DM (customer in this particular case).

Table 4 represents the normalized performance ratings, obtained by using (5) and (6). By applying the normalization procedure, the various measures are reduced to a single measure.

TABLE III. THE INITIAL DECISION MATRIX

Criteria Alternatives	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
<i>optimization</i>	<i>max</i>	<i>max</i>	<i>max</i>	<i>max</i>	<i>max</i>	<i>max</i>	<i>max</i>	<i>min</i>	<i>min</i>
w_j	0.1338	0.1345	0.1994	0.1338	0.0281	0.0698	0.0661	0.1994	0.0351
<i>ppr</i>	3	2	3	4	4	2	160	35	55000
A_1	3	2	3	3	4	3	150	30	46000
A_2	5	5	3	5	4	5	189	45	61000
A_3	4	3	4	4	4	4	150	15	52000
A_4	3	2	3	2	3	3	260	20	59000
A_5	2	2	4	2	3	3	180	30	40000

TABLE IV. THE NORMALIZED PERFORMANCE RATINGS

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
A_1	0.0000	0.0000	0.0000	-0.3333	0.0000	0.5000	-0.0909	0.1667	0.4286
A_2	0.6667	0.0000	0.0000	0.3333	0.0000	1.5000	0.2636	-0.3333	-0.2857
A_3	0.3333	-0.6667	1.0000	0.0000	0.0000	1.0000	-0.0909	0.6667	0.1429
A_4	0.0000	-0.6667	0.0000	-0.6667	-1.0000	0.5000	0.9091	0.5000	-0.1905
A_5	-0.3333	-0.6667	1.0000	-0.6667	-1.0000	0.5000	0.1818	0.1667	0.7143

TABLE V. THE RANKING RESULTS OBTAINED ON THE BASIS OF S_i

Alternatives	S_i	Rank
A_1	0.0325	4
A_2	0.1795	2
A_3	0.3560	1
A_4	-0.0191	5
A_5	0.0529	3

The ranking results obtained on the basis of S_i , which are calculated by using (7), are given in Tab. 5.

In this step, we decide whether to continue with the evaluation or to stop here. In the case when $S_i > 0$ it is acceptable to continue with the procedure. Because the overall performance rating for alternative A_4 – *Šljivarski put* – is

lower than 0, it will be excluded from the further assessment. The other alternatives will be submitted to further evaluation procedure because they fulfilled the desired conditions.

Table 6 demonstrates the ranking results based on the S'_i value, obtained by using (8)-(11), respectively, for $\gamma=1$ and $\lambda=0.5$.

TABLE VI. THE RANKING RESULTS BASED ON THE S'_i VALUE

	d_i^{\max}	S_i^+	n_i^+	\bar{S}_i^+	c_i	S_i	S'_i	Rank
A_1	0.0349	0.0832	3	0.0108	0.0229	0.0325	0.0097	3
A_2	0.1047	0.2560	4	0.0449	0.0748	0.1795	0.1047	2
A_3	0.1994	0.4517	5	0.0712	0.1353	0.3560	0.2207	1
A_5	0.1994	0.3046	5	0.0106	0.1050	0.0529	-0.0521	4

According to the obtained results presented in Tab. 6, the most suitable house for purchasing is the alternative A_3 – *Ključ*. This alternative fulfills all of the requirements expressed through the *ppr* values and some of them even exceed. In this case $\gamma=1$, which

means that the priority is given to the alternative that has the best matching with *ppr* values while the last ranked is the alternative A_5 – *Beli breg*.

The influence of the compensation coefficient γ on the final ranking order is shown in Tab. 7.

TABLE VII. THE RANKING RESULTS OBTAINED ON THE BASIS OF DIFFERENT VALUES OF γ

	$\gamma=0$		$\gamma=0.5$			$\gamma=1$		
	S'_i	Rank	c_i	S'_i	Rank	c_i	S'_i	Rank
A_1	0.0325	4	0.0114	0.0211	3	0.0229	0.0097	3
A_2	0.1795	2	0.0374	0.1421	2	0.0748	0.1047	2
A_3	0.3560	1	0.0676	0.2883	1	0.1353	0.2207	1
A_5	0.0529	3	0.0525	0.0004	4	0.1050	-0.0521	4

Varying of the γ brings some changes in the ranking order of the alternatives. While the alternative A_1 remained in the first position, the fourth position changed in the case when $\gamma=0$. Namely, in that case, the alternative A_1 – *Podliv* is the last ranked because it has the worst overall performance ratings.

The given example exactly shows that the WS PLP method gives the DM the possibility to choose among the alternative that has the good matching with set requirements and that which has the best performances of all considered alternatives. Additionally, DM is aware of that which alternative does not satisfy the requirements and could exclude it from further evaluation in the early stage.

IV. CONCLUSION

The main aim of this paper is to emphasize the applicability of the WS PLP method in the case of a house selection. The decision process is based on the 9 criteria that belong to the 4 main dimensions important for house selection that are: transportation network, neighborhood infrastructure, community environment, and house attributes. The 5 potential houses in the Zaječar are submitted to the evaluation procedure. The significance of the criteria is determined by using the Entropy method. The main reason for using the mentioned method for obtaining the criteria weights is reducing subjectivity to the minimum possible level.

The obtained results proved that the proposed WS PLP method is useful and contributes to the facilitation of the decision

process. We consider that this technique could be helpful to the real estate agents because they could determine in an easy way which real estate should have the priority for offering to the particular client.

The proposed methodology is based on the use of crisp numbers and this represents the main constraint of the paper. Because the uncertainty and vagueness are immanent to real-world problems, it is very hard to express them by using only crisp numbers. Incorporation of the fuzzy, intuitionistic or neutrosophic numbers into proposed methodology would increase its convenience for application in the unpredictable and changeable business environment.

REFERENCES

1. Kornysheva, E. & Salinesi, C. (2007). MCDM techniques selection approaches: state of the art. In *2007 IEEE Symposium on Computational Intelligence in Multi-Criteria Decision-Making*, pp. 22-29. IEEE.
2. Zavadskas, E. K., Turskis, Z. & Kildienė, S. (2014). State of art surveys of overviews on MCDM/MADM methods. *Technological and Economic Development of Economy*, 20(1), pp. 165-179.
3. Gavade, R. K. (2014). Multi-Criteria Decision Making: An overview of different selection problems and methods. *International Journal of Computer Science and Information Technologies*, 5(4), pp. 5643-5646.
4. Zavadskas, E. K. & Turskis, Z. (2011). Multiple criteria decision making (MCDM) methods in economics: an overview. *Technological and Economic Development of Economy*, 17(2), pp. 397-427.
5. Mardani, A., Jusoh, A., Zavadskas, E. K., Cavallaro, F. & Khalifah, Z. (2015). Sustainable and renewable energy: An overview of the application of multiple criteria decision making techniques and approaches. *Sustainability*, 7(10), pp. 13947-13984.
6. Chai, J., Liu, J. N. & Ngai, E. W. (2013). Application of decision-making techniques in supplier selection: A systematic review of literature. *Expert Systems with Applications*, 40(10), pp. 3872-3885.
7. Stanujkic, D. & Zavadskas, E. K. (2015). A modified weighted sum method based on the decision-maker's preferred levels of performances, *Studies in Informatics and Control* 24(4), pp. 461-470.
8. Srinivasan, V. C. (1994). Using the analytic hierarchy process in house selection. *The Journal of Real Estate Finance and Economics*, 9(1), pp. 69-85.
9. Schniederjans, M. J., Hoffman, J. J. & Sirmans, G. S. (1995). Using goal programming and the analytic hierarchy process in house selection. *The Journal of Real Estate Finance and Economics*, 11(2), pp. 167-176.
10. Mulliner, E., Smallbone, K. & Maliene, V. (2013). An assessment of sustainable housing affordability using a multiple criteria decision making method. *Omega*, 41(2), pp. 270-279.
11. Becker, A. & Becker, J. (2017). A selection of offers on the Szczecin residential market with the AHP method. *Folia Oeconomica Stetinensia*, 17(1), pp. 68-79.
12. Shannon, C.E. (1948). A Mathematical Theory of Communication. *Bell System Technical Journal*, 27(3), pp. 379-423.
13. Churchman, C. W., & Ackoff, R. L. (1954). An approximate measure of value, *Journal of the Operations Research Society of America*, 2(2), pp. 172-187.
14. Fishburn, P. C. (1967). Additive utilities with incomplete product set: applications to priorities and assignments, *Operations Research*, 15(3), pp. 537-542.
15. Stanujkic, D., Magdalinovic, N., & Jovanovic, R. (2013). A multi-attribute decision making model based on distance from decision maker's preferences, *Informatica*, 24(1), pp. 103-118.
16. Li, L. (2011). Housing choice in an affluent Shanghai – decision process of middle class Shanghai residents. *Modern Economy*, 2, pp. 9-17.