

Third International Scientific Conference
on Economics and Management

EMAN 2019



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SELECTED PAPERS



**3rd INTERNATIONAL SCIENTIFIC CONFERENCE
EMAN 2019**

***EMAN 2019 – Economics & Management:
How to Cope With Disrupted Times***

SELECTED PAPERS

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CONTENTS

THE RELATIONSHIP BETWEEN INTEGRATION OF TECHNOLOGY - INCREASE CUSTOMER SPENDING - CUSTOMER SATISFACTION: MONKEY MODEL.....	1
Mislav Šimunić Marina Perišić Prodan Ljubica Pilepić Stifanich	
“SOFT” PERSPECTIVE OF THE BUSINESS PROCESS ORIENTATION	13
Aleksander Janeš Rajko Novak Armand Faganel	
IMPORTANCE AND SATISFACTION OF EMPLOYEES WITH FACTORS RELATED TO JOB SATISFACTION: DIFFERENCES BETWEEN GENERATION X AND Y	23
Eva Jereb Marko Urh Špela Strojín Primož Rakovec	
A FRAMEWORK FOR THE QUALITY CONTROL MANAGER SELECTION BASED ON THE PIPRECIA AND WS PLP METHODS	33
Gabrijela Popović	
ON THE INFLUENCE OF FINANCIAL EDUCATION AT FINANCIAL LITERACY	45
Zuzana Kozubíková	
IMPACT OF NON-LINEAR VOLATILITY IN STOCK-SPECIFIC RISK ON THE TURNOVER OF ACTIVELY MANAGED PORTFOLIOS.....	53
Plamen Patev Kaloyan Petkov	
ANALYSIS OF PROFIT AND LOSS STATEMENT OF THE LISTED COMPANIES IN CROATIA	63
Vlasta Roška Dalija Kuvačić Zvonko Merkaš	
THE IMPACT OF USING THE INFORMATION TECHNOLOGIES ON INTERNATIONAL BUSINESS DEVELOPMENT OF STATE-OWNED COMPANIES IN THE REPUBLIC OF CROATIA.....	73
Dalija Kuvačić Vlasta Roška Daniel Behtanić	
EXPORT COMPETITIVENESS OF BULGARIAN BOTTLED WINES	81
Tanya Georgieva Damyán Kirechev	
THE ROLE OF ENTREPRENEURSHIP EDUCATION IN FOSTERING ENTREPRENEURIAL INTENTIONS	91
Ivona Huđek Karin Širec	
ON THE REGIONAL DIFFERENCES IN FINANCIAL LITERACY OF THE UNIVERSITY STUDENTS	99
Aleš Kozubík	
THE CHALLENGES OF DIGITAL ECONOMY DEVELOPMENT IN SOUTH-EAST EUROPEAN COUNTRIES	107
Marijana Vidas-Bubanja Snežana Popovčić-Avrić Iva Bubanja	

DO DEVELOPING COUNTRIES FACE THE “MIDDLE INCOME TRAP”? EVIDENCE FROM A NOVEL UNIT ROOT TEST	117
Aycan Hepsag Bariş Erkan Yazici	
THE LEARNING ORGANIZATION UNDERSTANDING IN DISRUPTIVE TIMES AND ITS IMPACT ON ORGANIZATIONAL PERFORMANCE: THE APPAREL INDUSTRY CASE	125
Esmir Demaj	
MIGRATION AND MOBILITY OF QUALIFIED MILLENNIALS	135
Alice Reissová Jana Šimsová	
INFORMATION AND COMMUNICATION TECHNOLOGY AND THEIR INFLUENCE ON BUSINESSES GROWTH IN SLOVAKIA	143
Marcela Hallová Martina Hanová	
SUSTAINABLE ACCOMMODATION FACILITIES IN BULGARIA – REAL FACT OR NOT?	149
Petr Scholz	
AN INTEGRATED MODEL FOR IMPLEMENTING A BUSINESS PERFORMANCE MANAGEMENT SYSTEM IN SMES IN AUSTRIA AND SLOVAKIA	159
Rudolf Grünbichler Jozef Klučka	
THE CITY OF ZAGREB AND CROATIA: A PICTURE OF CAPITAL CITY’S CONTRIBUTION TO NATIONAL ECONOMIC GROWTH	171
Vinko Miličević Zoran Bubaš Olivera Jurković Majić	
INTERNET MARKETING APPROACHES IN PROMOTION OF HIGHER EDUCATION INSTITUTIONS*	181
Ivana Jadrić Jasmina Dlačić Drago Ružić	
OVERFUNDING IN CROWDFUNDING ON STARTNEXT AND KICKSTARTER PLATFORMS – ARE PRODUCT OFFERINGS MORE SUCCESSFUL THAN OTHER PROJECTS?	193
Michał Gałkiewicz	
IMPACT OF BANK LENDING ON DEVELOPMENT OF THE AGRICULTURAL SECTOR IN BULGARIA	201
Damyan Kirechev	
FARMLAND SIZE INEQUALITY AND LAND CONCENTRATION IN BULGARIAN AGRICULTURE	211
Tanya Georgieva	
CRYPTOCURRENCIES: PERSPECTIVES OF A DIGITAL-ECONOMIC PHENOMENON	219
Armin Kovači Slaven Ljolje	
BANK RESTRUCTURING THROUGH THE PROCESS OF BANK INTEGRATION DURING THE GLOBAL FINANCIAL CRISES OF 2007	225
Irena Lekoska, PhD	

Index of Authors

A

Aleksander Janeš, 13
Aleš Kozubík, 99
Alice Reissová, 135
Armand Faganel, 13
Armin Kovači, 219
Aycan Hepsag, 117

B

Barış Erkan Yazici, 117

D

Daliya Kuvačić, 63, 73
Damyan Kirechev, 81, 201
Daniel Behtanić, 73
Drago Ružić, 181

E

Esmir Demaj, 125
Eva Jereb, 23

G

Gabrijela Popović, 33

I

Irena Lekoska, PhD, 225
Iva Bujanja, 107
Ivana Jadrić, 181
Ivona Huđek, 91

J

Jana Šimsová, 135
Jasmina Dlačić, 181
Jozef Klučka, 159

K

Kaloyan Petkov, 53
Karin Širec, 91

Lj

Ljubica Pilepić Stifanich, 1

M

Marcela Hallová, 143
Marijana Vidas-Bujanja, 107
Marina Perišić Prodan, 1
Marko Urh, 23
Martina Hanová, 143
Michał Gałkiewicz, 193
Mislav Šimunić, 1

O

Olivera Jurković Majić, 171

P

Petr Scholz, 149
Plamen Patev, 53
Primož Rakovec, 23

R

Rajko Novak, 13
Rudolf Grünbichler, 159

S

Slaven Ljolje, 219
Snežana Popovčić-Avrić, 107

Š

Špela Stojin, 23

T

Tanya Georgieva, 81, 211

V

Vinko Miličević, 171
Vlasta Roška, 63, 73

Z

Zoran Bubaš, 171
Zuzana Kozubíková, 45
Zvonko Merkaš, 63

PREFACE

Association of Economists and Managers of the Balkans headquartered in Belgrade – Serbia, Faculty of Management Koper – Koper, Slovenia; DOBA Business School - Maribor, Slovenia; Integrated Business Faculty - Skopje, Macedonia and Faculty of Management - Zajecar, Serbia organized Third International Scientific Conference on Economics and Management: How to Cope With Disrupted Times - EMAN 2019 in Ljubljana on March 28, 2019 at the Hotel M.

Third International Scientific Conference on Economics and Management - EMAN - aimed to establish and expand international contacts and co-operation across regions and countries. The main purpose of the conference was to provide scientists an encouraging and stimulating environment in which they may present results of their research to the scientific community and general public.



The conference theme was discussed in following sections:

1. Economics,
2. Management,
3. Law,
4. Tourism,
5. Environment,
6. Technology.

The aim of this year's conference has been achieved - bring together the academic community of the Balkans region and other countries and publication of their papers with the purpose of popularization of science and their personal and collective affirmation. The unique program combined presentation of the latest scientific developments in these areas, interactive discussions and other forms of interpersonal exchange of experiences.

The conference was opened by **Prof. dr Rasto Ovin**, Dean of the DOBA Business School – Maribor, Slovenia and a member of the Scientific Committee of the conference; **Uroš Mirčević**, President of the Association of Economists and Managers of the Balkans and **Prof. dr Tatjana Horvat** representative of the Faculty of Management Koper, University of Primorska, Slovenia.

Within publications from EMAN 2019 conference:

- **25 double peer reviewed papers** have been published in the *EMAN 2019 – Economics & Management: How to Cope with Disrupted Times - Selected Papers – The 3rd Conference on Economics and Management*,
- **87 double peer reviewed papers** have been published in the *EMAN 2019 Conference Proceedings – Economics & Management: How to Cope With Disrupted Times* and
- **63 abstracts** have been published in the *EMAN 2019 Book of Abstracts*.

EMAN 2019 publications have more than **1.000 pages**. Besides that, **57 papers** have been accepted for publication in the conference partner journals also, namely:

1. **Managing Global Transitions (MGT)** is a quarterly, scholarly journal published by the University of Primorska, Faculty of Management (Slovenia). Journal covers diverse aspects of transitions and welcomes research on change and innovation in increasingly digitalized and networked economic environments, from a societal, organizational, and technological perspective. MGT fosters the exchange of ideas, experience and knowledge among developed and developing countries with different cultural, organizational and technological traditions. The Journal is officially listed in EconLit, International Bibliography of the Social Sciences, Directory of Open Access Journals, Erih Plus, IBZ Online, EconPapers, Cabell's Directory of Publishing Opportunities, EBSCO and ProQuest.
2. **Management: Journal of Sustainable Business and Management Solutions in Emerging Economies** is a diverse journal with a wide range of management disciplines. It is published in three issues per year (May, September, and December). PDF of papers is freely available online. The University of Belgrade is publishing the Journal since 1996. It has the highest national rank (M24 – 4 points) and currently is indexed/ranked/abstracted in EBSCO, DOAJ, Google Scholar, MIT library, CEEOL, UTS library, Periodicos CAPES, National Library of Serbia Digital Repozitory, Serbian Citation Index and Ulrich Periodicals.
3. **Management** is an open access peer-reviewed international journal published by the Faculty of Management Koper, University Primorska (Slovenia) since 2005. It is indexed/ listed in Erih Plus, Directory of Open Access Journals, EconPapers and EBSCO. The journal Management is intended for managers, researchers, students and scholars, who develop skills and put into practice knowledge on organisation management. The journal integrates practitioners', behavioural and legal aspects of management. It is dedicated to publishing articles on activities and issues within organisations, their structure and resources.
4. **The Facta Universitatis, Series: Economics and Organization (FU Econ Org)** is an open access peer-reviewed international journal published by the University of Niš (Republic of Serbia). FU Econ Org has been published since 1993. The journal has high national rank in Serbia (M51 – 3 points) and currently, it is being indexed in DOAJ, ERIH PLUS - European Reference Index for the Humanities and Social Sciences, Index Copernicus International, CEEOL, EconBiz, SCIndex (Serbian Citation Index), CiteFactor,

OAJI - Open Academic Journals Index, DRJI - Directory of Research Journals Indexing, JournalTOCs, EZB - Die Elektronische Zeitschriftenbibliothek, Google Scholar, BASE - Bielefeld Academic Search Engine, ROAD - Directory of Open Access scholarly Resources, SUNCAT and INFOBASE INDEX (India).

5. **Journal of Innovative Business and Management** is referred in international scientific journal bases DOAJ, EconPapers, ResearchGate and RePec. It has been published since 2009 and since then it has been attracting more and more interest among the readers, who predominantly come from academia and business practice.
6. **Journal of Sustainable Development (JSD)** is an international journal published by the Integrated Business Faculty – Skopje, Macedonia. JSD area includes three pillars of economic, social and environmental development issues. All these aspects are considered relevant for publishing in the JSD. The Journal is officially listed in the respected EBSCO database, CEEOL database, as well as the databases of Business Source Complete and Sustainability Reference Center. All articles published in the Journal are also indexed in these databases.
7. **Our Economy: Journal of Contemporary Issues in Economics and Business (JCIEB)** is an international open access, peer reviewed, and scientific journal, published continuously since 1954 by University of Maribor, Faculty of Economics and Business (Slovenia). At present, the journal is indexed/listed in EconLit, EBSCO, DOAJ, ProQuest, RePEc and numerous other databases.
8. **Balkans Journal of Emerging Trends in Social Sciences (Balkans JETSS)** - new scientific journal, published by the Association of Economists and Managers of the Balkans. Aims and scope are economics, management, law and tourism. After publication of first issues of the journal, Balkans JETSS will be submitted for indexation in all relevant scientific databases: SCOPUS, EBSCO, DOAJ, Google Scholar, etc.

Participation in the conference took **373 researchers with the paper** representing:

- 24 different countries,
- 93 different universities,
- 63 eminent faculties,
- 10 scientific institutes,
- 27 colleges,
- Various ministries, local governments, public and private enterprises, multinational companies, associations, etc.

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A FRAMEWORK FOR THE QUALITY CONTROL MANAGER SELECTION BASED ON THE PIPRECIA AND WS PLP METHODS

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Abstract: *Increasing demand for quality products has an impact on the rising significance of the role of the quality control manager. Recruiting a new quality control manager and his/her selection amongst a greater number of the candidates who have applied is a very complex task. There are a significant number of the criteria that a candidate should meet, which on their part affect the final ranking and selection. It is a very delicate decision because there is a very thin line separating a good choice from a bad one. With the aim of facilitating the process of the selection of a quality control manager, the application of the framework based on the PIPRECIA (PIVot Pairwise RElative Criteria Importance Assessment) and WS PLP (Weighted Sum method, based on the decision-maker's Preferred Levels of Performances) methods is proposed in this paper. The applicability of the proposed framework is presented by a numerical example, where three decision-makers evaluate six candidates against the five evaluation criteria.*

Keywords: *WS PLP method, PIPRECIA method, quality control manager, selection.*

1. INTRODUCTION

In modern business conditions, when companies are faced with extremely strong competition, the key success item is the quality personnel who invest their knowledge, skills and energy in the achievement of the intended results. In that sense, the evaluation and selection of such personnel, who will contribute to its further development and progress, is a very important and complex task for companies to do. The process of the evaluation and selection of a candidate does not only acknowledge the considered candidate's existing performances, but it also acknowledges how he/she will behave in the future and how he/she will contribute to the company's future business operations.

Beside educated and competent personnel, the fact that significantly influences a company's performances and rating is certainly the quality of the product or service offered to its consumers. Companies always tend to completely meet their consumers' expectations and, if possible, even exceed them. Different processes are conducted within a particular company, but the quality control process is extremely important because it ensures that the final product is in accordance with consumers' expressed preferences [1]. So, it is clear that the selection of a quality control manager is a critical issue because of the fact that his/her knowledge, abilities and competencies are what the final result, i.e. the product to be offered to consumers, depends on. Because of that, different criteria should be taken into account during the process of the selection of a quality control manager in order to promulgate the best possible decision, and Multiple Criteria Decision-Making methods (MCDM) are a useful help in looking for the optimal choice.

MCDM methods are a part of operational research and management science, which has especially been increasingly popular in the last few decades. Over time, different methods have been proposed, such as the widely known: SAW or WS [2], AHP [3], TOPSIS [4], as well as the

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newly-introduced methods, such as: SWARA [5], WASPAS [6] and EDAS [7]. Apart from the previously mentioned methods, there are many more that are possible to apply in many business fields and in solving real-life problems. Additionally, appropriate extensions of the MCDM methods are proposed by introducing fuzzy, grey or rough numbers.

Various MCDM methods are applied in the case of personnel selection. For instance, Karabasevic et al. used a combination of the SWARA and ARAS methods, as well as the SWARA and WASPAS methods [8], [9]. Appropriate extensions for resolving the issue of personnel selection are proposed, the paper by Afshari et al., which provides an overview of fuzzy decision-making applied in the mentioned area, being a good example [10]. The selection of an adequate project manager is a very interesting topic as well [11], [12]. Zolfani et al. used the AHP-COPRAS-G methods with the aim of selecting an adequate quality control manager [1]. For that purpose, a framework based on the PIPRECIA [13] and WS PLP [14] methods is proposed in this paper. In order to demonstrate the usability of the proposed framework, the rest of the paper is organized as follows: in the second section, the proposed framework is explained; in the third section, an illustrative numerical example is given; in the end, the conclusion is presented.

2. THE PROPOSED FRAMEWORK

In this section, a detailed explanation of the PIPRECIA and WS PLP methods, which are the basis of the proposed framework for the selection of the optimal candidate who will perform the role of the quality control manager, is given. The PIPRECIA method is proposed for the purpose of determining the significance of the evaluation criteria, whereas the WS PLP method is used for the purpose of the final ranking and selection of the optimal alternative, i.e. the optimal candidate.

2.1. THE PIPRECIA METHOD

In the MCDM methods application process, defining criteria weights is a very important stage. For that purpose, different MCDM methods are used, such as: the AHP method [3], the entropy method [15], the SWARA method [5] and the KEMIRA method [16]. In this paper, the utilization of the PIPRECIA method, introduced by Stanujkic et al., is proposed [13]. The given method is very useful to apply in the conditions when the decision-making process involves a larger number of participants, when it could be applied through the following steps.

Step 1. Determine the evaluation criteria that will be the basis for carrying out the decision-making process.

Step 2. Detect the relative significance s_j , starting from the second criterion in the following manner:

$$s_j = \left\{ \begin{array}{ll} >1 & \text{when } C_j \succ C_{j-1} \\ 1 & \text{when } C_j = C_{j-1} \\ <1 & \text{when } C_j \prec C_{j-1} \end{array} \right\}. \quad (1)$$

Step 3. Define the coefficient k_j as follows:

$$k_j = \begin{cases} 1 & j = 1 \\ 2 - s_j & j > 1 \end{cases}. \quad (2)$$

Step 4. Determine the recalculated value q_j by applying the following Eq.:

$$q_j = \begin{cases} 1 & j = 1 \\ \frac{q_{j-1}}{k_j} & j > 1 \end{cases}. \quad (3)$$

Step 5. Distinguish the relative weights of the estimated criteria in the following manner:

$$w_j = \frac{q_j}{\sum_{k=1}^n q_k}, \quad (4)$$

where w_j is the relative weight of the criterion j .

2.2. THE WS PLP METHOD

The WS PLP method proposed by Stanujkic and Zavadskas [14] represents a modified and improved version of the widely known WS method. It enables the acknowledgement of the decision-maker's (hereinafter referred to as the *DM*) expectations to a higher degree by introducing preferred performance ratings, namely *ppr* values. So, the *DM* determines in advance the criteria values that reflect his/her requirements, and available alternatives are estimated relative to these values. This method enables making a clear distinction between the alternatives with the best performances among all from that which best fits in the set preconditions expressed through the *ppr* values. Besides, during the procedure, the alternatives that are not acceptable, i.e. those not matching the given limits, are excluded from the further evaluation process. In that manner, a set of available alternatives are transformed into a set of appropriate alternatives, and a selection is performed out of the second set.

This method is considered appropriate to apply in the process of the selection of a quality control manager since the *DMs* involved in the procedure mainly know what their expectations are in connection with the candidates' competences; by applying the WS PLP method, they can immediately express them and estimate the candidates according to their requirements. Also, the given method provides such *DMs* with a possibility of deciding whether they want to give advantage to the candidate who is the best of all the other candidates, or to the candidate who better meets the given *ppr* values. Sometimes, some alternatives have a good ranking position because they have good performances relative to one or only a few criteria, while in respect to the other criteria they may even be worse. The application of the WS PLP method exactly enables the minimization of the occurrence of a situation of this kind because it clearly indicates whether the given alternative has a better position because some parameters are extremely good, whereas the other are quite bad, thus quite reducing the possibility of making bad and inadequate decisions.

The computational procedure related to the application of the WS PLP method is as follows:

Step 1. A decision matrix containing evaluation criteria, criteria weights and the alternatives that will be estimated is created.

Step 2. DMs determine the *ppr* values according to their preferences, which depicts the elements of the virtual alternative $A_0 = \{x_{01}, x_{02}, \dots, x_{0n}\}$. In case the DM does not define the *ppr* value of any criterion, it is determined as follows:

$$x_{0j} = \begin{cases} \max_i x_{ij} & | j \in \Omega_{\max} \\ \min_i x_{ij} & | j \in \Omega_{\min} \end{cases}, \quad (5)$$

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

Step 3. The normalization procedure is performed by applying Eqs (6) and (7):

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

$$r_{ij} = \frac{x_j^* - x_{ij}}{x_j^+ - x_j^-}; j \in \Omega_{\min}, \quad (7)$$

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

Step 4. The overall performance rating for each alternative is calculated by the following Eqs:

$$S_i = \sum_{j=1}^n w_j \cdot r_{ij}, \quad (8)$$

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

The calculation should be continued through the following steps in case two or more alternatives fulfil the condition $S_i > 0$. Otherwise, the procedure ends in this step and the best choice is the alternative whose S_i is the biggest.

Step 5. For the alternatives that meet the condition $S_i > 0$, the compensation coefficient should be determined by applying the following Eqs.:

$$c_i = \lambda d_i^{\max} + (1 - \lambda) \bar{S}_i^+, \quad (9)$$

where:

$$d_i^{\max} = \max_i d_i = \max_i r_{ij} w_j, \quad (10)$$

$$\bar{S}_i^+ = \frac{S_i^+}{n_i^+}, \quad (11)$$

where d_i^{max} denotes 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^+ is the average performance ratings gained on the basis of the criteria, so that $r_{ij} > 0$, n_i^+ represents the number of the criteria of the alternative i , so that $r_{ij} > 0$, λ is the coefficient ($\lambda = [0,1]$) and most often it is set at 0.5.

Step 6. The calculation of the adjusted performance rating should be performed for all the alternatives in which S_i by using Eq. (12):

$$S'_i = \sum_{j=1}^n w_j r_{ij} - \gamma c_i, \tag{12}$$

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

Step 7. The highest S'_i value belongs to the most acceptable alternative ranked as the first and the remaining alternatives are ranked in ascending order according to their S'_i values.

3. AN ILLUSTRATIVE NUMERICAL EXAMPLE

With the aim of implying the usability and applicability of the proposed framework for the selection of a quality control manager, three *DMs* were involved in the evaluation of the six potential candidates (A_1, A_2, A_3, A_4, A_5 and A_6) for the position in industry production. Every candidate involved in the selection process had different performances relative to his/her experience, education and other characteristics. The *DMs*, who are experts in the field of human resources and quality management, estimated the candidates concerned according to the previously defined criteria. These evaluation criteria are given in Table 1.

<i>Criteria</i>		<i>Description</i>
C_1	Familiarity with the product and the materials used	Appropriate knowledge of the product performances and the characteristics of the materials used
C_2	Education and experience	Appropriate formal education and a suitable period of time spent in the same position in previous workplaces
C_3	Familiarity with administration	The knowledge of the laws, regulations and procedures relative to the given business field
C_4	Flexibility	The ability to react fast to changes in the environment, as well as in the company
C_5	Risk assessment	The ability to successfully anticipate and manage risk
C_6	Teamwork	The ability to connect and work with other associates

Table 1: Evaluation criteria [1]

In the paper by Zolfani et al. [1], apart from the criteria for the evaluation of the candidates for the position of the quality control manager given in Table 1, there is yet another one – *Salary*. In our case, the mentioned criterion is not involved in the given set because it is treated as a constant.

The first step in the application of the proposed framework involves the determination of the weights of the given criteria. Each *DM* makes his/her own estimation of the proposed criteria and, by using Eqs. (1)-(4), the final criteria weights are determined. The weights of the criteria for the first *DM* are presented in Table 2.

<i>Criteria</i>		s_j	k_j	q_j	w_j
C_1	Familiarity with the product and the materials used		1	1	0.19
C_2	Education and experience	1.00	1.00	1.00	0.19
C_3	Familiarity with administration	0.80	1.20	0.83	0.16
C_4	Flexibility	0.50	1.50	0.56	0.10
C_5	Risk assessment	1.30	0.70	0.79	0.15
C_6	Teamwork	1.30	0.70	1.13	0.21
				5.32	1.00

Table 2: Criteria weights – DM_1

The results presented in Table 2 show that the most significant criteria according to the DM_1 is the criteria C_6 – *Teamwork*. By applying the previously mentioned Eqs. (1)-(4), the criteria weights, which are in accordance with the standpoint of the DM_2 , are determined (Table 3).

<i>Criteria</i>		s_j	k_j	q_j	w_j
C_1	Familiarity with the product and the materials used		1	1	0,15
C_2	Education and experience	1.10	0.90	1.11	0.16
C_3	Familiarity with administration	1.00	1.00	1.11	0.16
C_4	Flexibility	1.10	0.90	1.23	0.18
C_5	Risk assessment	1.00	1.00	1.23	0.18
C_6	Teamwork	0.90	1.10	1.12	0.16
				6.81	1.00

Table 3: Criteria weights – DM_2

As can be seen in Table 3, the most significant criteria in this case are the criteria C_4 – *Flexibility* and C_5 – *Risk assessment*. In Table 4, the weights of the criteria for the DM_3 obtained by applying Eqs. (1)-(4) are presented.

<i>Criteria</i>		s_j	k_j	q_j	w_j
C_1	Familiarity with the product and the materials used		1	1	0,16
C_2	Education and experience	1.20	0.80	1.25	0.20
C_3	Familiarity with administration	0.70	1.30	0.96	0.16
C_4	Flexibility	1.00	1.00	0.96	0.16
C_5	Risk assessment	1.00	1.00	0.96	0.16
C_6	Teamwork	1.10	0.90	1.07	0.17
				6.20	1.00

Table 4: Criteria weights – DM_3

According to the DM_3 , the criterion C_2 – *Education and experience* stands out as the most significant.

In Tables 5, 6 and 7, the initial decision matrices are presented. Each matrix contains the estimations of the candidates relative to the six evaluation criteria. The assessment was performed by using the scale from 1 to 5, where 1 is the worst grade, and 5 is the best. Beside the given estimations and criteria weights, the decision matrices contain the *ppr* values for each *DM*.

		C_1	C_2	C_3	C_4	C_5	C_6
		max	max	max	min	max	max
Candidates	w_j	0.19	0.19	0.16	0.10	0.15	0.21
	<i>ppr</i>	5	3	3	3	4	3
	A_1	5	5	2	3	4	3
	A_2	4	3	5	3	3	3
	A_3	3	3	3	4	3	4
	A_4	1	3	2	4	2	2
	A_5	3	2	2	4	1	4
	A_6	2	2	4	3	1	4

Table 5: The initial decision matrix – DM_1

		C_1	C_2	C_3	C_4	C_5	C_6
		max	max	max	min	max	max
Candidates	w_j	0.15	0.16	0.16	0.18	0.18	0.16
	<i>ppr</i>	3	4	2	3	3	2
	A_1	4	4	4	2	3	3
	A_2	3	3	3	3	2	3
	A_3	2	4	3	4	2	4
	A_4	1	3	2	4	1	4
	A_5	2	2	2	4	2	3
	A_6	2	2	3	3	1	4

Table 6: The initial decision matrix – DM_2

		C_1	C_2	C_3	C_4	C_5	C_6
		max	max	max	min	max	max
Candidates	w_j	0.16	0.20	0.16	0.16	0.16	0.17
	<i>ppr</i>	4	4	2	3	4	4
	A_1	4	4	4	2	3	4
	A_2	3	3	4	3	4	5
	A_3	3	2	4	4	3	4
	A_4	2	2	3	4	2	5
	A_5	2	2	3	3	1	4
	A_6	2	3	3	3	2	3

Table 7: The initial decision matrix – DM_3

By applying Eqs. (6)-(12), the final results are defined and the rank of the considered alternatives, in this case the candidates, is determined. In Table 8, the final results for the DM_1 are presented in the case of the 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	0.0731	1	0.0627	0.0104	2	0.1254	-0.0522	2
A_2	0.0077	3	0.0392	-0.0315	3	0.0784	-0.0707	3
A_3	0.0673	2	0.0530	0.0143	1	0.1061	-0.0388	1

Table 8: The ranking of the candidates – DM_1

As the results show, the alternatives A_4 , A_5 and A_6 are rejected during the procedure as unacceptable, and the first-ranked alternative according to the DM_1 is the alternative A_3 , when $\gamma = 0.5$ and $\gamma = 1$. When primacy is given to the best alternative of all, i.e. when $\gamma = 0$, the alternative A_1 ranks the first.

	$\gamma = 0$		$\gamma = 0.5$			$\gamma = 1$		
	S'_i	Rank	c_i	S'_i	Rank	c_i	S'_i	Rank
A_1	0.2861	2	0.0726	0.2135	2	0.1451	0.1410	1
A_2	0.0741	3	0.0720	0.0022	3	0.1439	-0.0698	3
A_3	0.3620	1	0.1242	0.2379	1	0.2483	0.1137	2
A_4	0.0595	4	0.1349	-0.0754	4	0.2697	-0.2103	4
A_6	0.0178	5	0.1337	-0.1159	5	0.2675	-0.3147	5

Table 9: The ranking of the candidates – DM_2

The alternative A_3 is the best alternative according to the DM_2 when $\tilde{\alpha} = 0$ and $\tilde{\alpha} = 0.5$, but when $\tilde{\alpha} = 1$, the best-ranked is the alternative A_1 . The alternative A_5 is excluded from the list of the suitable alternatives during the procedure (Table 9).

	$\gamma = 0$		$\gamma = 0.5$			$\gamma = 1$		
	S'_i	Rank	c_i	S'_i	Rank	c_i	S'_i	Rank
A_1	0.3677	2	0.1189	0.2488	2	0.2378	0.1299	1
A_2	0.4017	1	0.1378	0.2639	1	0.2756	0.1261	2
A_3	0.2406	3	0.1170	0.1236	3	0.2340	0.0067	3
A_4	0.0394	4	0.0768	-0.0373	4	0.1536	-0.1141	4

Table 10: The ranking of the candidates – DM_3

According to the DM_3 , the most adequate alternative is the alternative A_2 when $\gamma = 0$ and $\gamma = 0.5$, whereas when $\gamma = 1$ and when a priority is given to the alternatives satisfying the previously set ppr values, the alternative A_1 is the best-ranked alternative.

With the aim of defining the overall ranking order of the considered alternatives based on the evaluation of all the three *DMs*, WA operators are used. The WA operators are applied by using the following Eq.:

$$S_i'' = \frac{1}{n} \sum_{j=1}^n S_i', \quad (13)$$

where S_i'' stands for the overall performance rating of the alternatives according to all the *DMs*. The ranking is performed in ascending order and the optimal choice is the alternative whose S_i'' is the highest.

	$\gamma = 0$		$\gamma = 0.5$		$\gamma = 1$	
	S_i''	Rank	S_i''	Rank	S_i''	Rank
A_1	0.2423	1	0.1576	1	0.0729	1
A_2	0.1612	3	0.0782	3	-0.0048	3
A_3	0.2233	2	0.1253	2	0.0272	2
A_4	0.0330	4	-0.0376	4	-0.1081	5
A_5	-	-	-	-	-	-
A_6	0.0059	5	-0.0386	5	-0.1049	4

Table 11: The overall ranking of the candidates

The alternative A_1 is singled out as the best choice (Table 11), which is completely justified because the candidate A_1 always took the first or second position in all of the three observations, which is especially suitable when primacy is given to the alternatives with a better matching with the pre-set *ppr* values.

4. CONCLUSION

The selection of an adequate candidate is a very complex task that requires the perception and evaluation of every aspect important for a concrete workplace. The significance of the selection of the optimal personnel for performing the function of the quality control manager is also great because a certain person's education, ability, knowledge and skills have quite an impact on producing products of an adequate quality. Because evaluation and personnel selection are conducted based on certain criteria which are very often conflicting, the application of the MCDM methods is absolutely justified and desirable.

In this case of ours, the proposed framework for the selection of the quality control manager is based on the PIPRECIA and WS PLP methods. The PIPRECIA method is used for the criteria weight determination, while the final evaluation and ranking are performed by using the WS PLP method. The applicability of the given framework is tested by an illustrative numerical example pointed to the evaluation of the six candidates relative to the six evaluation criteria. With the aim of reducing subjectivity and gaining a more reliable decision, group decision-making is applied, i.e. the evaluation is conducted by three *DMs*. Bearing in mind the fact that bias is present in the decision-making process, its effects are in this way minimized, which automatically increases the trustworthiness of the final choice.

The key advantages of this paper reflect in the proposal for the application of a suitable model that will facilitate the decision-making process and increase the validity of the final decision. The prerogative of the PIPRECIA method is its simplicity and convenience for utilization in a group decision-making environment. On the other hand, the main advantage of the WS PLP method reflects in a possibility of making a selection between the alternative that better fits the established requirements and the alternative that has the best performance ratings of all of them and exceeds the pre-set conditions. Despite the fact that all MCDM methods more or less incorporate *DMS*' preferences, they are exactly expressed through *ppr* values in the WS PLP methods.

The application of crisp numbers is the main deficiency of this paper because vagueness and uncertainty are not incorporated in a proper manner. Besides, in this case, no sensitivity analysis is performed in order to test the stability of the proposed framework and its resistance to changing conditions. At the same time, the given disadvantages could be treated as proposals for the improvement of the given framework. Irrespective of the foregoing deficiency, its applicability in the field of personnel selection, i.e. the selection of a quality control manager in this particular case, cannot be denied.

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