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RANKING OF COMPANIES ACCORDING TO THE INDICATORS OF CORPORATE SOCIAL RESPONSIBILITY BASED ON SWARA AND ARAS METHODS

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Abstract

Corporate sector and companies have recognized the importance of implementation of strategy of corporate social responsibility in order to increase the company's image and responsibility towards society and the communities where they operate. Multinational companies in their everyday activities and operations pay more attention to sustainable models of corporate social responsibility. The focus of this paper is to identify the indicators of corporate social responsibility and to rank companies according to the indicators. Proposed framework for evaluation and ranking is based on the SWARA and the ARAS methods. The usability and efficiency of the proposed framework is shown on an illustrative example.

Keywords: corporate social responsibility, CSR indicators, CSR dimensions, SWARA, ARAS, MCDM

1. INTRODUCTION

In contemporary business, companies are not only recognized for its business results and the position they occupy on the market, but also by their characteristics in terms of responsibility towards the community, and support for the employees and business partners, care for the environment and sustainable development.

The concept of corporate sustainability derives from the general concept of sustainable development, in relation to organizations. The Earth Summit in Rio de Janeiro in 1992 initiated general acceptance of sustainable development by business

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leaders, politicians and NGOs (Dyllick & Hockerts, 2002).

For organizations, it was a challenge to simultaneously improve social and human welfare while reducing ecological impact and ensuring the effective achievement of organizational objectives (Sharma & Ruud, 2003). Environmental protection (Shrivastava, 1995) or social responsibility of an organization (Carroll, 1999) may be the main focus of corporation's sustainability, but it also may expanded to integrate corporate economic activities with organizational concern about the natural and the social environment (Dyllick & Hockerts, 2002). Corporate social responsibility is also used to describe the integration of social, environmental, and economic concerns into an organization's culture, decision-making, strategy, and operations (Berger et al., 2007).

Corporate social responsibility is becoming increasingly important parameter in evaluation of the company. Inadequate rating in terms of social responsibility can affect the image of the company, and ultimately may affect the operating results of the company. If the company is socially responsible and nurtures a positive image, it means that the company cares about quality relationships to employees, partners, communities and the natural environment. So that social responsibility becomes the basis for sustainable development of business of each company.

Commission of the European Communities (2002) defines CSR as a concept in which companies integrate in its business concern for society and the natural environment and in interaction with stakeholders, on a voluntary basis. The European Union outlined that the European market should be built on "balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment" (EU Treaty of Lisbon art. 3, 2007).

In the European Union, environment action programs - EAP, have directed the development of EU environment policy last 40 years. The Sixth Environmental Action Program (European Comission, 2010) which was in action from 2002 to 2012, focused on four priority areas, climate change, biodiversity, environment and health, and sustainable management of resources and wastes. The Sixth EAP accentuated that high environmental standards are also an engine for innovation and business opportunities, and must work to de-couple environmental impacts and degradation from economic growth: " Business must operate in a more eco-efficient way, in other words producing the same or more products with less input and less waste, and consumption patterns have to become more sustainable" (Paunkovic, 2014).

Investigating the definitions of topics in corporate social responsibility from certain literature we have noted three basic dimensions of CSR: social dimension of CSR involves operation of CSR towards society and community to contribute to a better society by being aware of its impact of operations on the community; the economic dimension of action includes that company through CSR operations improve positive image that may have impact ultimately on profitability; dimension of the natural environment (operation of CSR aims that company operations take place in the natural environment and develop in a sustainable way). In addition to operating results and financial indicators, the company with CSR activities presents itself as socially

responsible business by giving strong support to employees, environment and society (Kotler & Lee, 2005; Dahlsrud, 2006; Waldman et al., 2006; Uddin et al., 2008; RobecoSAM AG, 2014).

Multiple Criteria Decision-Making (MCDM) methods have been used in a number of research papers measuring the performance of companies in terms of corporate social responsibility using CSR indicators. Ebrahimi et al. (2014) uses MCDM for assessing CSR by applying Shannon entropy and VIKOR methods. Chen and Fan (2011) use fuzzy AḶ P to measure CSR, and Tafti et al. (2012) also uses fuzzy AḶ P for the assessment of CSR according to Islamic values.

This paper proposes a framework for ranking companies according to the indicators of CSR, with an illustrative example in which three companies will be ranked according to their activities in terms of CSR according to the indicators based on the use of SWARA and ARAS methods.

In the proposed approach the SWARA method is applied for determining weights of CSR indicators and ARAS method is applied for determining CSR of evaluated alternatives.

One of main objectives of the proposed framework is to make it simple and easy to use, which had a great influence to the MCDM method used in the proposed framework. As shown in Stanujkic et al. (2015), the use of the SWARA method requires significantly lower number of pairwise comparisons compared to the use of AHP method and the computational procedure of the SWARA method is also simpler compared to computational procedure of the AHP method. Similarity can be specified for the ARAS method which computational procedure is simpler compared to computational procedures of some prominent MCDM methods such as TOPSIS (Hwang & Yoon, 1981), VIKOR (Opricovic, 1998), PROMETHEE (Brans & Vinkce, 1985) and so on. Finally, to maintain simplicity, in the proposed framework is intentionaly avoided the use of fuzzy numbers, as wel as the use of fuzzy extensions of above mentioned MCDM methods.

Therefore, this manuscript is organized as follows: in section 2 CSR indicators that will be relevant for further research are defined, then in section 3 SWARA method is introduced, in section 4 ARAS method is presented. To further scrutinize the process of ranking companies according to indicators of CSR in section 5 a framework for ranking companies according to the CSR indicators is presented , while in section 6 illustrative example is presented.

2. IDENTIFICATION OF CSR INDICATORS

Indicators of CSR represent a certain set of indicators, based on which, an objective assessment of the implementation of CSR in the company or organization is performed, and to what extent the CSR is applied in practice.

Companies are investing significant resources into finding the "ideal" set of indicators of CSR. However, there is no consensus in the literature which determines the weight of indicators of CSR, and it may vary from author to author. In general, there is an agreement between the dimensions of action in three spheres. Graves labels dimensions of action as „3 P“: for Profit: economic dimension, People: social dimension and Planet for ecological

dimension or environment dimension (Graves et al., 2002).

Some of the studies deal with the measurement of CSR and ranking of companies according to the CSR as well as indicators of CSR (Turker, 2009; Pérez & Bosque, 2013; Ebrahimi et al., 2014; Farooq et al., 2014).

Certain number of studies have approached the problem of defining the weights of CSR as follows: Krut and Munis (1998) in their study of performance measurement of CSR do not use weights, Graves et al. (2002) in their research give the same weight to each of the criteria, Hu et al. (2011) uses the principle of assigning different weights with Fuzzy MCDM method, MCDM VIKOR method is used in his research by Ebrahimi et al. (2014), but weight is determined by Shannon's entropy while for the ranking of alternatives and the companies applies VIKOR method, while Graafland et al. (2004) for assigning weights are using weights based on the responses of companies and NGOs.

The study included three mobile telecommunication companies (Telekom Srbija d.o.o. designated as A_1, Telenor d.o.o. designated as A_2 and Vip mobile d.o.o. designated as A_3) that in their operations apply concepts of CSR.

Table 1. Indicators and sub indicators of CSR

Indicators	Sub indicators
Social	Education Work environment and employees Culture and Art Health and Safety Social and Humanitarian giving
Environment	Ecology and Environment Protection Recycling Sustainable management of natural resources The use of clean energy Prevention of pollution
Economic	Preserving profitability and profit Contribution to economic development

Based on investigated literature and CSR reports of mentioned companies, the authors propose the following model of indicators and sub indicators of telecommunications sector of CSR that will be relevant for research and ranking of companies according to the CSR (Table 1).

3. THE COMPUTATIONAL PROCEDURE OF THE SWARA METHOD

The new Step-wise Weight Assessment Ratio Analysis (SWARA) technique was proposed by Kersuliene et al. (2010). Although it is a newly proposed method, it was used to solve many problems such as a rational dispute resolution (Kersuliene et al., 2010), the selection of packaging design (Stanujkic et al., 2015), an architect selection (Kersuliene & Turskis, 2011), the design of products (Zolfani et al., 2013), a machine tool selection (Aghdaie et al., 2013), the prioritizing of the sustainability assessment indicators of the energy system (Zolfani & Saparauskas, 2013) and a personnel selection (Zolfani & Banihashemi, 2014).

The process of determining the relative weights of criteria using SWARA method can accurately be shown by using the following steps:

Step 1. The criteria are sorted in descending order based on their expected significances.

Step 2. Starting from the second criterion, the respondent expresses the relative

importance of criterion j in relation to the previous (j-1) criterion, for each particular criterion. According to Kersuliene et al. (2010), this ratio is called the Comparative importance of average value, s_j.

Step 3. Determine the coefficient k_j as follows:

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

Step 4. Determine the recalculated weight q_j as follows:

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

Step 5. The relative weights of the evaluation criteria are determined as follows:

$$w_j = \frac{q_j}{\sum_{k=1}^{n} q_k}, \quad (3)$$

where w_j denotes the relative weight of criterion j.

4. THE COMPUTATIONAL PROCEDURE OF THE ARAS METHOD

The ARAS method was proposed by Zavadskas and Turskis (2010). Despite the fact that the ARAS method is a relatively new method, the ARAS method until now has been used for solving decision making problems in diffrent areas, such as those related to construction (Lazauskas et al., 2015; Medineckiene et al., 2015), selection of the chief accountant (Keršulienė & Turskis, 2014), waste dump site selection (Shariati et al., 2014), ranking of financial institutions (Reza & Majid, 2013) and so on.

The usability and efficiency of the ARAS methods have also been confirmed by its extensions, such as ARAS-G method (Turskis & Zavadskas, 2010) which enable the use of grey numbers, and extension proposed with the aim to enable the use of interval-valued triangular fuzzy numbers (Stanujkic, 2015).

The process of solving decision making problems using ARAS method, similarly to the other methods of MCDM, starts with forming the decision matrix and determining weights of criteria. After these initial steps, the remaining part of solving MCDM problem using ARAS method can be precisely expressed using the following steps:

Step 1. Determine the optimal performance rating for each criterion. In this step the decision maker sets the optimal performance rating for each criterion. If the decision maker does not have a preferences, the optimal performance ratings are calculated as:

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

where denotes the optimal performance rating of j-th criterion, Ω_{max} denotes the benefit criteria, i.e. the higher the values are, the better it is; and Ω_{min} denotes the set of cost criteria, i.e. the lower the values are, the better it is.

Step 2. Calculate the normalized decision matrix. The normalized performance ratings

are calculated using the following formula:

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\sum_{i=0}^{m} x_{ij}} ; & j \in \Omega_{\max} \\ \dfrac{1/x_{ij}}{\sum_{i=0}^{m} 1/x_{ij}}; & j \in \Omega_{\min} \end{cases}, \quad (5)$$

where r_{ij} denotes the normalized performance rating of i-th alternative in relation to the j-th criterion, $i = 0, 1, ..., m$.

Step 3. Calculate the weighted normalized decision matrix. The weighted normalized performance ratings are calculated using the following formula:

$$v_{ij} = w_j \, r_{ij} \ , \quad (6)$$

where v_{ij} denotes the weighted normalized performance rating of i-th alternative in relation to the j-th criterion, $i = 0, 1, ..., m$.

Step 4. Calculate the overall performance rating, for each alternative. The overall performance ratings can be calculated using the following formula:

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

where S_i denotes the overall performance rating of i-th alternative, $i = 0, 1, ..., m$.

Step 5. Calculate the degree of utility for each alternative. When evaluating alternatives, it is not only important to determine the best ranked alternative. It is also important to determine relative performances of considered alternatives, in relation to the optimal alternative. For this purpose the degree of utility is used, and it can be calculated using the following formula:

$$Q_i = \frac{S_i}{S_0} \ , \quad (8)$$

where Q_i denotes the degree of utility of i-th alternative, and S_0 is the overall performance index of optimal alternative, $i = 1, 2, ..., m$.

Step 6. Rank alternatives and/or select the most efficient one. The considered alternatives are ranked by ascending Q_i, i.e. the alternative with the largest value of Q_i is the best placed.

5. A FRAMEWORK FOR RANKING COMPANIES ACCORDING TO THE CSR INDICATORS

A framework for evaluating companies according to the CSR indicators, based on the application of the SWARA and the ARAS methods can be accurately demonstrated using the following steps.

Step 1. Determining the significance of criteria or sub-criteria. In this step, the decision-maker, using the SWARA method, determines the significance of criteria, as well as their sub-criteria. Finally, the resulting weights of sub-criteria that will be used for evaluation are determined using the following formula:

$$w_{ij}^{r} = \frac{w_i w_{ij}}{\sum_{i,j} w_i w_{ij}} \ , \quad (9)$$

where i denotes criteria, j denotes sub criteria.

Step 2. Evaluation of alternatives in relation to the selected set of criteria. In this

step, using the mark in the interval of 1-5 decision maker evaluates.

Step 3. Ranking and selection of the most appropriate company. In this step, using ARAS method, determining the performance of alternatives, and performs the selection of the company which in its business apply CSR.

6. ILLUSTRATIVE EXAMPLE: RANKING COMPANIES ACCORDING TO THE CSR INDICATORS

The evaluation method begins by determining the evaluation of criteria importance, as shown in Table 2.

The weights of sub-criteria, for criteria from table 2, are shown in tables 3-5.

The resulting weights of sub-criteria,

Table 2. The significance of criteria

	Criteria	Designation	s_j	k_j	q_j	w_j
C_1	Social			1	1	0.381
C_2	Environmental		0.11	1.11	0.901	0.344
C_3	Economic		0.25	1.25	0.721	0.275
					2.622	1.000

Table 3. Significance of sub-criteria for criteria Social

	Criteria	Designation	s_j	k_j	q_j	w_{1j}
C_{11}	Education	ED		1	1	0.317
C_{12}	Work environment and employees	WEE	0.15	1.15	0.870	0.276
C_{13}	Culture and Art	CA	0.25	1.25	0.696	0.221
C_{14}	Health and Safety	HS	0.19	1.19	0.585	0.186
C_{15}	Social and Humanitarian giving	SHG	0.29	1.29	0.453	0.144
					3.150	1.000

Table 4. Significance of sub-criteria for criteria Environmental

	Criteria	Designation	s_j	k_j	q_j	w_{2j}
C_{21}	Ecology and Environment Protection	EEP		1	1	0.368
C_{22}	Recycling	REC	0.09	1.09	0.917	0.338
C_{23}	Sustainable management of natural resources	SMNR	0.15	1.15	.798	0.294
C_{24}	The use of clean energy	UCE	0.25	1.25	0.638	0.235
C_{25}	Prevention of pollution	PP	0.3	1.3	0.491	0.181
					2.715	1.000

Table 5. Significance of sub-criteria for criteria Economic

	Criteria	Designation	s_j	k_j	q_j	w_{3j}
C_{31}	Preserving profitability and profit	PPP		1	1	0.600
C_{32}	Contribution to economic development	CED	0.5	1.5	0.667	0.400
					1.667	1.000

Table 6. Resulting weights of sub-criteria

	C_1 Social					C_2 Environmental					C_3 Economic	
w_i			0.381					0.344			0.274	
	I	II	III	IV	V	I	II	III	IV	V	I	II
	ED	WEE	CA	HS	SHG	EEP	REC	SMNR	UCE	PP	PPP	CED
w_{ij}	0.317	0.276	0.220	0.185	0.143	0.368	0.337	0.293	0.235	0.180	0.600	0.400
w_{ij}^r	0.101	0.088	0.070	0.059	0.046	0.106	0.097	0.084	0.068	0.052	0.138	0.092

obtained from the formula (9), are shown in table 6.

Ratings of three companies in relation to the selected set of criteria are shown in table 7.

telecommunication sector. According to the information available to authors, combination of SWARA-ARAS method for decision making has not been used to rank companies according to the CSR indicators.

Table 7. Ratings of evaluated companies (in relation to the selected set of criteria)

	C_1 Social					C_2 Environmental					C_3 Economic	
w_{ij}^r	0.101	0.088	0.070	0.059	0.046	0.106	0.097	0.084	0.068	0.052	0.138	0.092
	I	II	III	IV	V	I	II	III	IV	V	I	II
	ED	WEE	CA	HS	SHG	EEP	REC	SMNR	UCE	PP	PPP	CED
A_1	4	3	3	4	4	4	5	4	3	3	4	4
A_2	5	4	3	4	5	3	4	5	4	3	4	5
A_3	5	4	4	4	4	4	4	5	4	4	4	4

Weighted normalized decision matrix is shown in Table 8.

SWARA method is used to evaluate weights of indicators and sub-indicators, then ARAS

Table 8. Weighted normalized decision matrix

	C_1 Social					C_2 Environmental					C_3 Economic	
w_{ij}^r	0.101	0.088	0.070	0.059	0.046	0.106	0.097	0.084	0.068	0.052	0.138	0.092
	I	II	III	IV	V	I	II	III	IV	V	I	II
	ED	WEE	CA	HS	SHG	EEP	REC	SMNR	UCE	PP	PPP	CED
A_0	0.036	0.032	0.028	0.020	0.018	0.038	0.037	0.030	0.025	0.021	0.046	0.035
A_1	0.029	0.024	0.021	0.020	0.014	0.038	0.037	0.024	0.018	0.016	0.046	0.028
A_2	0.036	0.032	0.021	0.020	0.018	0.029	0.030	0.030	0.025	0.016	0.046	0.035
A_3	0.036	0.032	0.028	0.020	0.014	0.038	0.030	0.030	0.025	0.021	0.046	0.028

Final performances and ranking of evaluated alternatives are shown in Table 9.

Table 9. Results of ranking of alternatives

	S_i	Q_i	Rank
A_0	0.366		
A_1	0.316	0.066	3
A_2	0.337	0.082	1
A_3	0.348	0.082	1

method is used for ranking alternatives in our example companies. From the presented framework, as well as illustration example, we can conclude that SWARA-ARAS method is easily applicable, adaptive and it can be used to rank companies according to the CSR indicators. According to given framework and methodology Company 2 and Company 3 is ranked as best in terms of CSR.

7. CONCLUSION

Presently, companies are faced with the demands and efforts in terms of action in the field of corporate social responsibility. In this paper authors are proposing a framework for ranking companies according to CSR in

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РАНГИРАЊЕ ПРЕДУЗЕЋА ПРЕМА ИНДИКАТОРИМА ДРУШТВЕНЕ ОДГОВОРНОСТИ НА ОСНОВУ "SWARA" И "ARAS" МЕТОДА

Дарјан Карабашевић, Џејн Паунковић и Драгиша Станујкић

Извод

Привреда и компаније препознају значај имплементације стратегије корпоративне друштвене одговорности са циљем поправљања имица и одговорности компанија према друштву и заједницама у којима делују. Мултинационалне компаније у својим свакодневним активностима и операцијама обраћају више пажње на одрживе моделе корпоративне друштвене одговорности. Фокус овог рада је идентификација индикатора корпоративне друштвене одговорности и рангирање компаније према тим индикаторима. Предложени оквир за вредновање и рангирање се заснива на "SWARA" и "ARAS" методама. Употребљивост и ефикасност предложеног оквира је приказане на илустративном примеру.

Кључне речи: корпоративна друштвена одговорност, CSR индикатори, CSR димензије, SWARA, ARAS, MCDM

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