Journal of Process Management and New Technologies
www.japmnt.com ISSN: 2334-735X (Print) ISSN: 2334-7449 (Online)
Vol. 10, Issue 3-4, 2022, pp. 66-74

MEREC-COBRA APPROACH IN E-COMMERCE DEVELOPMENT STRATEGY SELECTION

Gabrijela POPOVIĆ[1*], Đorđe PUCAR[2], Florentin SMARANDACHE[3]

[1] *Faculty of Applied Management, Economics and Finance, Belgrade, University Business Academy in Novi Sad, Belgrade, Serbia, gabrijela.popovic@mef.edu.rs*

[2] *Faculty of Applied Management, Economics and Finance, Belgrade, Belgrade, University Business Academy in Novi Sad, Serbia, djordje@mef.edu.rs*

[3] *Department of Mathematics, University of New Mexico, Gallup, New Mexico, United States of America, smarand@unm.edu*

Abstract: *The research objective of the paper is to propose a model, based on the Multiple-Criteria Decision-Making (MCDM) methods, that facilitates a selection process of an adequate strategy directed to the development of e-commerce. For that aim, the MEthod based on the Removal Effects of Criteria (MEREC) is applied for defining the criteria weights. The recently proposed COmprehensive Distance Based RAnking (COBRA) method is used for the final assessment and ranking of the considered alternatives. The applicability of the proposed model is tested by using an example borrowed from the literature. Three alternative development strategies are assessed against five evaluation criteria. The final results proved the applicability and reliability of the proposed MCDM model.*

Keywords: *MEREC method, COBRA method, development strategies, e-commerce, selection*

Original scientific paper
Received: 09.11.2022
Accepted: 02.12.2022
Available online: 05.12.2022

1. Introduction

An extensive range of online business activities that involve manipulating products and services represents electronic commerce or e-commerce. It can be stated that e-commerce is "*usually associated with buying and selling over the Internet, or conducting any transaction involving the transfer of ownership or rights to use goods or services through a computer-mediated network.*" (Gupta, 2014). The significance of e-commerce was especially revealed during the pandemic COVID-19. Three crucial obstacles that e-commerce faced during the pandemic are: 1) product availability; 2) logistics and transportation disruptions; and 3) consumer protection (Alfonso et al., 2021). In order to maintain proper functioning and retain consumer satisfaction, there is a need for applying adequate strategies for the development and enhancement of e-commerce.

---

[*] Corresponding author

Note: Paper is presented at the 8th international scientific conference „Innovation as the initiator of development". Extended version of the paper is submitted to the Journal of Process Management and New Technologies.

The selection of the appropriate strategy is influenced by many criteria which exacerbate making a final choice. By introducing adequate mathematical models in the selection process, this problem could be overcome. The Multiple-Criteria Decision-Making (MCDM) methods impose as a suitable approach because they are convenient for application in conditions when existing many mutually conflicting criteria. Until now, many different MCDM approaches have been introduced, to mention some of the newly proposed: Combined Compromise Solution method (CoCoSo) (Yazdani et al., 2018), Full COnsistency Method (FUCOM) (Pamučar et al., 2018), Measurement of Alternatives and Ranking according to COmpromise Solution (MARCOS) (Stević et al., 2020), simple WeIghted Sum Product method (WISP) (Stanujkić et al., 2021). Proposed MCDM methods and models were used for problem solvation in different business fields (Lee & Chang, 2018; Rouyendegh et al., 2019; Stojčić et al., 2019; Štirbanović et al., 2019; Ture et al., 2019; Karabašević et al., 2020; Lin et al., 2020; Chowdhury & Paul, 2020; Tan et al., 2021; Sotoudeh-Anvari, 2022). Researchers and practitioners use the MCDM techniques to facilitate the decision process in the area of e-commerce as well (Alharbi & Naderpour, 2016; Aggarwal & Aakash, 2018; Sohaib et al., 2019; Li & Sun, 2020; Bączkiewicz, 2021a; Bączkiewicz et al., 2021b; Bączkiewicz et al., 2021c; Wang et al., 2021; Ziemba, 2021; Naseem et al., 2021a; Naseem et al., 2021b; Wu et al., 2021; Torre et al., 2022).

A model based on the recently introduced MEthod based on the Removal Effects of Criteria (MEREC) (Keshavarz-Ghorabaee et al., 2021) and the COmprehensive Distance Based RAnking (COBRA) (Krstić et al., 2022) for selection of the appropriate development e-commerce strategy is proposed in this paper. The determination of the criteria weights is based on the MEREC method while the final assessment and ranking are performed by using COBRA method. The numerical example that illustrates the applicability of the proposed model is borrowed from the literature. To present the created model, the paper is organized as follows: Section 2 presents the explanation of the used methods; Section 3 contains numerical example; and in the end, the conclusion is given.

2. Methodology

2.1. The MEREC method

The MEREC method (Keshavarz-Ghorabaee et al., 2021) enables defining of the objective weights of criteria because it uses input data for that matter. Although the MEREC method has been recently proposed, the researchers recognized its potential and used it for resolving various decision-making problems (Keshavarz-Ghorabaee, 2021; Trung & Thinh, 2021; Rani et al., 2022; Ulutaş et al., 2022; Mishra et al., 2022; Ivanović et al., 2022). The computation procedure of the MEREC method involves the following steps.

Step 1. Form a decision matrix:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2m} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{im} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{nj} & \cdots & x_{nm} \end{bmatrix}, \tag{1}$$

where x_{ij} is the performance rating of alternative i in relation to criterion j ($x_{ij} > 0$), n are alternatives and m are criteria.

Step 2. Normalize the decision matrix by using following Eq.:

$$n_{ij}^{x}=\begin{cases}\frac{\min\limits_{k} x_{kj}}{x_{ij}} & if \quad j\in B\\ \frac{x_{ij}}{\max\limits_{k} x_{kj}} & if \quad j\in C^{'}\end{cases} \tag{2}$$

where n_{ij}^{x} represents elements of the normalized matrix *N*, *B* is the set of benefit criteria, and *C* is the set of cost criteria.

Step 3. Calculation of the overall performance of the alternatives as is shown:

$$S_i = ln\left(1+\left(\frac{1}{m}\sum_j |ln(n_{ik}^{x})|ij\right)\right), \tag{3}$$

where S_i is the overall performance of the alternatives.

Step 4. Compute the alternatives` performances by removing each criterion in the following manner:

$$S'_{ij} = ln\left(1+\left(\frac{1}{m}\sum_{k,k\neq j}|ln(n_{ik}^{x})|ij\right)\right), \tag{4}$$

where S'_{ij} denotes the overall performance of alternative *i* regarding the removal of criterion *j*.

Step 5. Compute the total of the absolute deviations. The removal effect of the criterion *j* is calculated as follows:

$$E_j = \sum_i |S'_{ij} - S_i|, \tag{5}$$

where E_j represents the effect of removing criterion *j*.

Step 6. Define the overall criteria weights in the following way:

$$w_j = \frac{E_j}{\sum_k E_k}, \tag{6}$$

where w_j represents the weight of the criterion *j*.

2.2. The COBRA method

The COBRA method (Krstić et al., 2022) is recently proposed and because of that, the possibilities of this method are not examined yet. Until now, the COBRA method is mentioned in two papers regarding industry 4.0 and reverse logistics (Balázs et al., 2022; Fauzdar et al., 2022). The computation procedure of the COBRA method could be illustrated by a series of steps.

Step 1. Define a decision matrix in the way presented in the section regarding the MEREC method.

Step 2. Create the normalized decision matrix in the following way:

$$\Delta = [\alpha_{ij}]_{n\times m}, \tag{7}$$

where

$$\alpha_{ij} = \frac{a_{ij}}{\max\limits_{i} a_{ij}}. \tag{8}$$

Step 3. Create the weighted normalized decision matrix Δ_w by using Eq. (9):

$$\Delta_w = [w_j \times \alpha_j]_{m\times n}, \tag{9}$$

where w_j denotes the relative weight of criterion *j*.

Step 4. Define the positive ideal (PIS_j), negative ideal (NIS_j), and average solution (AS_j) regarding each criterion function as follows:

$$PIS_j = \max_i (w_j \times \alpha_{ij}), \quad \forall j = 1, \dots, m \ for\ j \in B, \tag{10a}$$

$$PIS_j = \min_i (w_j \times \alpha_{ij}), \quad \forall j = 1, \dots, m \ for\ j \in C, \tag{10b}$$

$$NIS_j = \min_i (w_j \times \alpha_{ij}), \quad \forall j = 1, \dots, m \ for\ j \in B, \tag{11a}$$

$$NIS_j = \max_i (w_j \times \alpha_{ij}), \quad \forall j = 1, \dots, m \ for\ j \in C, \tag{11b}$$

$$AS_j = \frac{\sum_{i=1}^{n} (w_j \times \alpha_{ij})}{n}, \quad \forall j = 1, \dots, m \ for\ j \in B, C, \tag{12}$$

where B is the set of benefit and C is the set of cost criteria.

Step 5. In this step, the distance from the positive ideal $\left(d(PIS_j)\right)$ and negative ideal $\left(d(NIS_j)\right)$ solutions should be defined. Also, the positive $\left(d(AS_j^+)\right)$ and negative distances $\left(d(AS_j^-)\right)$ from the average solutions should be determined. This procedure is performed in the following way:

$$d(S_j) = dE(S_j) + \sigma \times dE(S_j) \times dT(S_j), \ \forall j = 1, \dots, m, \tag{13}$$

where S_j is any solution $(PIS_j, NIS_j \text{ or } AS_j)$, σ represents the correction coefficient defined by using the following Eq.:

$$\sigma = \max_i dE(S_j)_i - \min_i dE(S_j)_i, \tag{14}$$

where $dE(S_j)_i$ and $dT(S_j)_i$ represents the Euclidian and Taxicab distances, respectively, which are calculated for the positive ideal solution calculated in the following way:

$$dE(PIS_j)_i = \sqrt{\sum_{j=1}^{m} (PIS_j - w_j \times \alpha_{ij})^2}, \quad \forall_i = 1, \dots, n, \quad \forall_j = 1, \dots, m, \tag{15}$$

$$dT(PIS_j)_i = \sum_{j=1}^{m} |PIS_j - w_j \times \alpha_{ij}|, \ \forall i = 1, \dots, n, \quad \forall j = 1, \dots, m. \tag{16}$$

For the negative ideal solutions, the Euclidian and Taxicab distances are obtained in the following way:

$$dE(NIS_j)_i = \sqrt{\sum_{j=1}^{m} (NIS_j - w_j \times \alpha_{ij})^2}, \ \forall_i = 1, \dots, n, \ \forall_j = 1, \dots, m, \tag{17}$$

$$dT(NIS_j)_i = \sum_{j=1}^{m} |NIS_j - w_j \times \alpha_{ij}|, \ \forall i = 1, \dots, n, \quad \forall j = 1, \dots, m. \tag{18}$$

For the positive distance from the average solution the Euclidian and Taxicab distances are calculated as follows:

$$dE(AS_j)_i^+ = \sqrt{\sum_{j=1}^{m} \tau^+ (AS_j - w_j \times \alpha_{ij})^2}, \ \forall_i = 1, \dots, n, \ \forall_j = 1, \dots, m, \tag{19}$$

$$dT(AS_j)_i^+ = \sum_{j=1}^{m} \tau^+ |AS_j - w_j \times \alpha_{ij}|, \ \forall i = 1, \dots, n, \ \forall j = 1, \dots, m. \tag{20}$$

$$\tau^+ = \begin{cases} 1 \ if \ AS_j < w_j \times \alpha_{ij} \\ 0 \ if \ AS_j > w_j \times \alpha_{ij} \end{cases}. \tag{21}$$

Finally, for the negative distance from the average solution the Euclidian and Taxicab distances are calculated in the following manner:

$$dE(AS_j)_i^- = \sqrt{\sum_{j=1}^{m} \tau^- (AS_j - w_j \times \alpha_{ij})^2}, \ \forall_i = 1, \dots, n, \ \forall_j = 1, \dots, m, \tag{22}$$

$$dT(AS_j)_i^- = \sum_{j=1}^{m} \tau^- |AS_j - w_j \times \alpha_{ij}|, \ \forall i = 1, \dots, n, \ \forall j = 1, \dots, m. \tag{23}$$

$$\tau^- = \begin{cases} 1 \; if \; AS_j > w_j \times \alpha_{ij} \\ 0 \; if \; AS_j < w_j \times \alpha_{ij} \end{cases}. \tag{24}$$

Step 6. Rank the considered alternatives in ascending order based on the comprehensive distances (dC_i) which is defined by using:

$$dC_i = \frac{d(PIS_j)_i - d(NIS_j)_i - d(AS_j)_i^+ + d(AS_j)_i^-}{4}, \forall i = 1, \ldots, n. \tag{25}$$

3. Numerical Example

In this section, the applicability of the proposed model will be illustrated by using an example regarding the selection of the e-commerce development strategies borrowed from the paper of Stanujkic et al. (2019). Three strategies are submitted under evaluation and they are:

- A_1 – E-customization and personalization
- A_2 – Social e-commerce adoption model
- A_3 – Strong search engine optimization – SEO

The considered strategies are evaluated against the following set of criteria:

- C_1 – The implementation of the strategy feasibility
- C_2 – The speed of implementation
- C_3 – Compliance with the corporate strategy
- C_4 – Compliance of strategy with the mission and vision of the organization and
- C_5 – General acceptance

All criteria involved in the decision process are of benefit type.

Decision-making involved one decision-maker and his ratings are presented in **Table 1.**

Table 1. Decision-makers` ratings of the alternative strategies

	C_1	C_2	C_3	C_4	C_5
A_1	3	3	3	2	2
A_2	5	4	5	5	5
A_3	3	3	4	5	5

Source: Stanujkic et al. (2019)

Criteria weights are obtained by using the MEREC method and Eqs. (1)-(6) and they are presented in **Table 2.**

Table 2. The criteria weights

	w_j
C_1	0.097
C_2	0.056
C_3	0.153
C_4	0.347
C_5	0.347

Source: Authors` calculation

As **Table 2** shows, the criteria C_4 – *Compliance of strategy with mission and vision of the organization* and C_5 – *General acceptance have the same highest weight among the considered criteria.*

Now, the COBRA method is applied to achieve the final result and ranking order of the considered alternative strategies. The computation is performed by using Eqs. (7)-(25). The obtained results and ranking order of the e-commerce development strategies are presented in **Table 3**.

Table 3. The results gained by applying the COBRA method

	$d(PIS)$	$d(NIS)$	$d(AS^{+})$	$d(AS^{-})$	dC	*Rank*
A_1	0.35242	0.00000	0.0000	0.2121	0.1411	3
A_2	0.00000	0.35242	0.1087	0.0000	-0.1153	1
A_3	0.05266	0.33619	0.0996	0.0138	-0.0923	2

Source: Authors` calculation

The results show that the optimal strategy for application in the existing conditions is strategy A_2 – *Social e-commerce adoption model* while the least adequate is strategy A_1 – *E-customization and personalization*.

Conclusion

The main goal of this paper was to introduce a new MCDM model suitable for the assessment and selection of e-commerce development strategies. For that purpose, two recently proposed techniques were used. The first one, called MEREC, was used for defining the criteria weights, while the second one, the COBRA method, was applied for the estimating and ranking of the considered alternative strategies. The applicability of the proposed model was verified by the numerical example retrieved from the literature. The obtained results confirmed the usefulness of the proposed approach. Namely, in the paper of Stanujkic et al. (2019), from whom the example is borrowed, in the first place is positioned the alternative A_2 – *Social e-commerce adoption model.* The second-ranked is the alternative A_3 – *Strong search engine optimization – SEO.* Alternative A_1 – *E-customization and personalization* has third, the worst position. The same ranking order is obtained in this case as well, although Stanujkic et al. (2019) give the same significance to all evaluation criteria. This result confirms the applicability and reliability of the proposed approach for application in decision-making in the e-commerce field as well as in other business areas.

The main shortage of paper is the involvement of only one decision-maker in the decision process which possibly leads to a biased result. By engaging more experts, the results and final ranking order would be more representative and real. Besides, the model is applied to the hypothetical example borrowed from the other authors. The potential of the MEREC-COBRA model as well as the potential of each method separately should be further examined and used for resolving real-world problems. Propositions for future research also go in direction of creating and introducing adequate extensions that will further extend the possibilities of these methods.

References

Aggarwal, A. G., & Aakash. (2018). Multi-criteria-based prioritisation of B2C e-commerce website. International *Journal of Society Systems Science*, 10(3), 201-222. https://doi.org/10.1504/IJSSS.2018.093940

Alharbi, S., & Naderpour, M. (2016, May). *E-commerce development risk evaluation using MCDM Techniques.* In International conference on decision support system technology (pp. 88-99). Springer, Cham. https://doi.org/10.1007/978-3-319-32877-5_7

Alfonso, V., Boar, C., Frost, J., Gambacorta, L., & Liu, J. (2021). E-commerce in the pandemic and beyond. *BIS Bulletin*, 36(9).

Bączkiewicz, A. (2021). MCDM based e-commerce consumer decision support tool. *Procedia Computer Science*, 192, 4991-5002. https://doi.org/10.1016/j.procs.2021.09.277

Bączkiewicz, A., Kizielewicz, B., Shekhovtsov, A., Wątróbski, J., Więckowski, J., & Salabun, W. (2021, December). Towards an e-commerce recommendation system based on MCDM methods. In 2021 International Conference on Decision Aid Sciences and Application (DASA) (pp. 991-996). IEEE. 10.1109/DASA53625.2021.9682356

Bączkiewicz, A., Kizielewicz, B., Shekhovtsov, A., Wątróbski, J., & Sałabun, W. (2021c). Methodical aspects of MCDM based E-commerce recommender system. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(6), 2192-2229. https://doi.org/10.3390/jtaer16060122

Balázs, G., Mészáros, Z. G., & Péterfi, C. A. (2022). Process Measurement and Analysis in a Retail Chain to Improve Reverse Logistics Efficiency. *Operational Research in Engineering Sciences: Theory and Applications*. https://doi.org/10.31181/oresta110722120g

Chowdhury, P., & Paul, S. K. (2020). Applications of MCDM methods in research on corporate sustainability: A systematic literature review. *Management of Environmental Quality: An International Journal*, 31(2), 385-405. https://doi.org/10.1108/MEQ-12-2019-0284

Fauzdar, C., Gupta, N., Goswami, M., & Kumar, R. (2022). MICMAC Analysis of Industry 4.0 in Indian Automobile Industry. *Journal of Scientific and Industrial Research (JSIR)*, 81(08), 873-881. 10.56042/jsir.v81i08.61847

Gupta, A. (2014). E-Commerce: Role of E-Commerce in today's business. *International Journal of Computing and Corporate Research*, 4(1), 1-8.

Ivanović, B., Saha, A., Stević, Ž., Puška, A., & Zavadskas, E. K. (2022). Selection of truck mixer concrete pump using novel MEREC DNMARCOS model. *Archives of Civil and Mechanical Engineering*, 22(4), 1-21. https://doi.org/10.1007/s43452-022-00491-9

Karabašević, D., Stanujkić, D., Zavadskas, E. K., Stanimirović, P., Popović, G., Predić, B., & Ulutaş, A. (2020). A novel extension of the TOPSIS method adapted for the use of single-valued neutrosophic sets and hamming distance for e-commerce development strategies selection. *Symmetry*, 12(8), 1263. https://doi.org/10.3390/sym12081263

Keshavarz-Ghorabaee, M., Amiri, M., Zavadskas, E. K., Turskis, Z., & Antucheviciene, J. (2021). Determination of Objective Weights Using a New Method Based on the Removal Effects of Criteria (MEREC). *Symmetry*, 13(4), 525. https://doi.org/10.3390/sym13040525

Keshavarz-Ghorabaee, M. (2021). Assessment of distribution center locations using a multi-expert subjective–objective decision-making approach. *Scientific Reports*, 11(1), 1-19. https://doi.org/10.1038/s41598-021-98698-y

Krstić, M., Agnusdei, G. P., Miglietta, P. P., Tadić, S., & Roso, V. (2022). Applicability of Industry 4.0 Technologies in the Reverse Logistics: A Circular Economy Approach Based on COmprehensive Distance Based RAnking (COBRA) Method. *Sustainability*, 14(9), 5632. https://doi.org/10.3390/su14095632

Lee, H. C., & Chang, C. T. (2018). Comparative analysis of MCDM methods for ranking renewable energy sources in Taiwan. *Renewable and Sustainable Energy Reviews*, *92*, 883-896. https://doi.org/10.1016/j.rser.2018.05.007

Li, R., & Sun, T. (2020). Assessing factors for designing a successful B2C E-Commerce website using fuzzy AHP and TOPSIS-Grey methodology. *Symmetry*, 12(3), 363. https://doi.org/10.3390/sym12030363

Lin, M., Huang, C., Xu, Z., & Chen, R. (2020). Evaluating IoT platforms using integrated probabilistic linguistic MCDM method. *IEEE Internet of Things Journal*, *7*(11), 11195-11208. 10.1109/JIOT.2020.2997133

Mishra, A. R., Saha, A., Rani, P., Hezam, I. M., Shrivastava, R., & Smarandache, F. (2022). An integrated decision support framework using single-valued-MEREC-MULTIMOORA for low carbon tourism strategy assessment. *IEEE Access*, 10, 24411-24432. 10.1109/ACCESS.2022.3155171

Naseem, M. H., Yang, J., & Xiang, Z. (2021a). Prioritizing the solutions to reverse logistics barriers for the e-commerce industry in Pakistan based on a fuzzy AHP-TOPSIS approach. *Sustainability*, 13(22), 12743. https://doi.org/10.3390/su132212743

Naseem, M. H., Yang, J., & Xiang, Z. (2021b). Selection of Logistics Service Provider for the E-Commerce Companies in Pakistan Based on Integrated GRA-TOPSIS Approach. *Axioms*, 10(3), 208. https://doi.org/10.3390/axioms10030208

Pamučar, D., Stević, Ž., & Sremac, S. (2018). A new model for determining weight coefficients of criteria in mcdm models: Full consistency method (fucom). *Symmetry*, 10(9), 393. https://doi.org/10.3390/sym10090393

Torre, N. M., Salomon, V. A., Loche, E., Gazale, S. A., & Palermo, V. M. (2022). Warehouse Location for Product Distribution by E-Commerce in Brazil: Comparing Symmetrical MCDM Applications. *Symmetry*, 14(10), 1987. https://doi.org/10.3390/sym14101987

Ture, H., Dogan, S., & Kocak, D. (2019). Assessing Euro 2020 strategy using multi-criteria decision-making methods: VIKOR and TOPSIS. *Social Indicators Research*, 142(2), 645-665. https://doi.org/10.1007/s11205-018-1938-8

Rani, P., Mishra, A. R., Saha, A., Hezam, I. M., & Pamucar, D. (2022). Fermatean fuzzy Heronian mean operators and MEREC-based additive ratio assessment method: An application to food waste treatment technology selection. International *Journal of Intelligent Systems*, 37(3), 2612-2647. https://doi.org/10.1002/int.22787

Rouyendegh, B. D., Topuz, K., Dag, A., & Oztekin, A. (2019). An AHP-IFT integrated model for performance evaluation of E-commerce web sites. *Information Systems Frontiers*, 21(6), 1345-1355. https://doi.org/10.1007/s10796-018-9825-z

Sohaib, O., Naderpour, M., Hussain, W., & Martinez, L. (2019). Cloud computing model selection for e-commerce enterprises using a new 2-tuple fuzzy linguistic decision-making method. *Computers & Industrial Engineering*, 132, 47-58. https://doi.org/10.1016/j.cie.2019.04.020

Sotoudeh-Anvari, A. (2022). The applications of MCDM methods in COVID-19 pandemic: A state of the art review. Applied *Soft Computing*, 109238. https://doi.org/10.1016/j.asoc.2022.109238

Stanujkic, D., Karabasevic, D., Maksimovic, M., Popovic, G., & Brzakovic, M. (2019). Evaluation of the e-commerce development strategies. *Quaestus*, 14, 144-152.

Stanujkic, D., Popovic, G., Karabasevic, D., Meidute-Kavaliauskiene, I., & Ulutaş, A. (2021). An integrated simple weighted sum product method—WISP. *IEEE Transactions on Engineering Management*, 1-12. 10.1109/TEM.2021.3075783

Stević, Ž., Pamučar, D., Puška, A., & Chatterjee, P. (2020). Sustainable supplier selection in healthcare industries using a new MCDM method: Measurement of alternatives and ranking according to COmpromise solution (MARCOS). *Computers & Industrial Engineering*, 140, 106231. https://doi.org/10.1016/j.cie.2019.106231

Stojčić, M., Zavadskas, E. K., Pamučar, D., Stević, Ž., & Mardani, A. (2019). Application of MCDM methods in sustainability engineering: A literature review 2008–2018. *Symmetry*, 11(3), 350. https://doi.org/10.3390/sym11030350

Štirbanović, Z., Stanujkić, D., Miljanović, I., & Milanović, D. (2019). Application of MCDM methods for flotation machine selection. *Minerals Engineering*, 137, 140-146. https://doi.org/10.1016/j.mineng.2019.04.014

Tan, T., Mills, G., Papadonikolaki, E., & Liu, Z. (2021). Combining multi-criteria decision making (MCDM) methods with building information modelling (BIM): A review. *Automation in Construction*, 121, 103451. https://doi.org/10.1016/j.autcon.2020.103451

Trung, D. D., & Thinh, H. X. (2021). A multi-criteria decision-making in turning process using the MAIRCA, EAMR, MARCOS and TOPSIS methods: A comparative study. *Advances in Production Engineering & Management*, 16(4), 443-456. https://doi.org/10.14743/apem2021.4.412

Ulutaş, A., Stanujkic, D., Karabasevic, D., Popovic, G., & Novaković, S. (2022). Pallet truck selection with MEREC and WISP-S methods. Strategic Management-International *Journal of Strategic Management and Decision Support Systems in Strategic Management*.

Wang, C. N., Dang, T. T., & Hsu, H. P. (2021). Evaluating sustainable last-mile delivery (LMD) in B2C E-commerce using two-stage fuzzy MCDM approach: A case study from Vietnam. *IEEE Access*, 9, 146050-146067. 10.1109/ACCESS.2021.3121607

Wu, T., Liu, X., Qin, J., & Herrera, F. (2021). An interval type-2 fuzzy Kano-prospect-TOPSIS based QFD model: Application to Chinese e-commerce service design. *Applied Soft Computing*, 111, 107665. https://doi.org/10.1016/j.asoc.2021.107665

Yazdani, M., Zarate, P., Zavadskas, E. K., & Turskis, Z. (2018). A Combined Compromise Solution (CoCoSo) method for multi-criteria decision-making problems. *Management Decision*. https://doi.org/10.1108/MD-05-2017-0458

Ziemba, P. (2021). Multi-criteria group assessment of E-commerce websites based on the new PROSA GDSS method–The case of Poland. *IEEE Access, 9,* 126595-126609. 10.1109/ACCESS.2021.3112573

© 2022 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).