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An extended Step-Wise Weighted Assessment Ratio Analysis for improving criteria prioritization process Using PROMETHEE Method

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Abstract: The new Step Wise Weighted Assessment Ratio Analysis (SWARA) method incorporates the opinion of experts, advocates or litigants about the importance ratio. The SWARA methodology can be used in the p in a virtual environment Special decision support systems Practical implementation and Alternative Dispute Resolution. Possible polymetallic mineralization Future map of various study datasets Step wise through integration Weighted Ratio Analysis Developed by (SWARA). In the world of external methods PROMETHEE methods are very popular. One of the reasons for this popularity called PROMCALC-Promethee It is very user-friendly calculation software. Many trainers use their multiple criteria PROMCALC to handle problems. However, all users in PROMETHEE methods regarding the consequences of model assumptions made them will not know. We study the application of PROMETHEE outranking methods to portfolio selection problems. Starting from the new formulation of the PROMETHEE V method, based on the concepts of frontier portfolios and c-optimal portfolios we develop several alternative approaches. The Priority Ranking System Method for Saturation Evaluation (PROMETHEE) was used to solve the problem. Alternative is Technological (C1), Economic (C2), Political and legislative (C3), Social (personnel) (C4). Evaluation parameters are biomedical micro electromechanical systems (BioMEMS) (A1), Nano technology (A2), Biotechnology (A3), Biomedical engineering (A4). PROMETHEE methods are the best solution. The solution with the shortest distance from the negative-best solution the longest distance is determined, but comparison of these distances is not considered significant. As a result, technical factors (C1) are ranked first, while economic factors (C2) are ranked lowest.
Keywords: SWARA, PROMETHEE, Analytical Hierarchy Process, Technological, Economic and Political.

1. Introduction

The objective weights are estimated from the decision metrics and Decision Experts (DEs) are obtained based on the information provided by [17]. Subjective criteria reported subjective opinions DEs [18]. Subjective criteria for evaluating weights for an innovative approach were pioneering and named SWARA (Step-Wise Weighted Assessment Ratio Analysis). In the SWARA method, the relative importance of preferences for each criterion and initial priority Determined by the concept of DEs, Then, the relative weight of each criterion is evaluated. Compared to Analytical Hierarchy Process (AHP), The SWARA approach does not require pair-wise comparisons and a high degree of stability, less computational complexity and there are easy procedures. We used Step-Wise Weighted Valuation Ratio Analysis (SWARA), which helped calculate the weights of various criteria, whereas Weighted Aggregate Sum Product Assessment (WASPAS) carried out the summation and product. Organizational environment while selecting a strong supplier that meets the defined criteria according to the assessment. When in SWARA, consistency is inherent due to its simplicity and the way expert responses are used. Hence, SWARA and WASPAS are an ideal combination for an industry like cement, where expert inputs are crucial in selecting a supplier. Among the existing multi-criteria methods, PROMETHEE methods occupy an important place. For practical multi-criteria decision-making problems Number of practitioners using these methods and Further development in the sensitive aspects of these methods and/or the number of interested researchers increases annually, it is increasing Number of documents and one or more PROMETHEE methods may be explained through conference presentations. Using the PROMETHEE method The solution obtained by this approach is also compared that is one objective of our article. Based on this study Analysis of PROMETHEE V, create an alternative to PROMETHEE V and leading to the development of several alternative approaches, it's better than PROMETHEE V involves large computational effort, but Solutions can be created that more closely mirror it. So in our study there are two main contributions: Based on the PROMETHEE method Different for portfolio selection, Developing computational "light" methods and these methods of the solutions obtained Compare quality a computational study with PROMETHEE V.

SWARA

2010 step-wise weighted estimation ratio analysis (SWARA) A new step-by-step weight assessment has been introduced and Multiple criteria One of the methods of decision making. A new step in weight estimation Ratio analysis (SWARA) method Allows adding expert opinion, lawyers or disputants about the importance ratio of attributes rational. The SWARA methodology can be used in a virtual environment. This research developing the SWARA system by sub-sec pays attention. As with SWARA's classic algorithm, first to the criteria Prioritize. Importance of this step it seems inevitable, because in this prioritization process, the accuracy rate is relatively high too much seems flawless. In this study, the classic is a step SWARA method will be applied. As mentioned earlier, SWARA is most useful in Policy making level decision making. The purpose of this study to address these concerns. [3] Despite SWARA's popularity due to with its clarity, accuracy and ease of expert collaboration, SWARA-based groundwater vulnerability assessment has a research gap. Then other MCDM methods Because of its benefits SWARA was the focus of this paper. Study each stratum is considered as the initial ranking input in the SWARA procedure. Thus, these studies Priority was given and SWARA parameters Instead of expert opinion.[4] Techniques for Agile Supplier Selection, increasingly. To validate the proposed model an actual case-study analysis is performed. Also, SWARA and PROMETHEE results the proposed decision maker is presented. Thus, SWARA is depending on a situation with known priorities Useful for some problems; Finally, SWARA is for decision-making Proposed in a specific context. Based on SWARA All development of decision-making models' methodology. [5] Hierarchical Weighted Ratio Analysis, Gray Correlation Analysis (GRA) and PROMETHEE (Priority Ranking Methodology for Enrichment Evaluation). OBJECTIVE OF SWARA IN THE STRUCTURE Weight loss of various types is age determining. The ranking process uses the PROMETHEE method. GRA option values different factors and used to connect from multiple factors. To test the proposed framework from a cement manufacturing plant Obtaining research data. [12] The SWARA method differs from other MCDM approaches in that because the ratio of several criteria SWARA is an important part of the system. Geology, Geophysics, Geochemistry including this method involves several criteria. A combination of GIS and MCDM In investigating mineral copper anomalies removes related obstacles to find a suitable solution is a complete complement tool; Because GIS is Analyse data for mine managers, Manage, display and Provides tools to integrate. SWARA The purpose of this investigation Cu is to identify opportunities. SWARA stands for one of the knowledge-based strategies. A case study is Anorak region. This is for a metal deposit there is more potential. Additionally, data assimilation compared with the obtained by SWARA method through ROC plot. [13]

PROMETHEE

In this study, with a comparative method of primary data to accept bad rice for those included as a validation of the decision support system PROMETHEE method was used. PROMETHEE (Priority Ranking Methodology for Enrichment Evaluation) is developed by France et al multi-criteria decision support system. In multi criteria analysis Compared to AHP (Analytic Hierarchy Process). PROMETHEE has some strength the comparative results indicate that this method has since been officially introduced by France the use of PROMETHEE has increased in various studies [13]. Related to PROMETHEE A literature review of 195 articles was conducted and we have been able to categorize them into nine areas: environmental management, Hydrology and Water Management, Business and Financial Management, Chemistry, Logistics and Transportation, Manufacturing and Assembly, Energy Management, Social and others. Medicine, Agriculture, Education, Design, Decision to choose a better stock in the stock market used PROMETHEE to build the support model [15].Universities in Indonesia for Geometrics ranking developed a new approach, a scale weighting method for entropy and using the PROMETHEE II ranking [16]. Social, economic and natural resources and Using high-angle scales To select the sustainability concept of manufacturing companies PROMETHEE was used as a method [17]. PROMETHEE, using vouchers Select the home environment that people prefer [18]. But Ruskin's users choose to solve the problem PROMETHEE is not used. [25] The solution obtained by this approach is by directly solution obtained that is the purpose of our article. Based on this study Analysis of PROMETHEE V, Alternatives to PROMETHEE V and leading to the development of several alternative approaches, It's better than PROMETHEE V involves more computational effort, But the ranking of all portfolios is very close Can create reflective solutions. So in our study There are two main contributions: Based on the PROMETHEE method Different for portfolio selection, Several MCDM have been proposed Improving the quality of decision making and Minimizing estimation deviations, Among these the PROMETHEE method is the most widely used. It is simplicity, clarity and such as stability it has some merits. It is between the valuation values of the alternatives Evaluates alternatives according to interval and accepts the net for rank; it avoids compensation and affects the relative desirability of alternatives. Also, decision makers (TMs) according to the practical situation Priority operation can be selected. PROMETHEE method Proposed in 1982 by France (1982), it is for solving MCDM problems a great outranking method. [22]

TABLE 1. Data Set for SWARA

	A1	A2	A3	A4
C1	56	87	34	94
C2	89	88	89	86
C3	67	78	72	55
C4	86	42	97	67
Max	89	88	97	94

Min	56	42	34	55
max-Min	33	46	63	39
	33	46	63	39

This table 1 shows that the value of dataset for SWARA Alternative: Alternative is Technological, Economic, Political and legislative, Social (personnel). Evaluation Parameter: A1, A2, A3, A4.

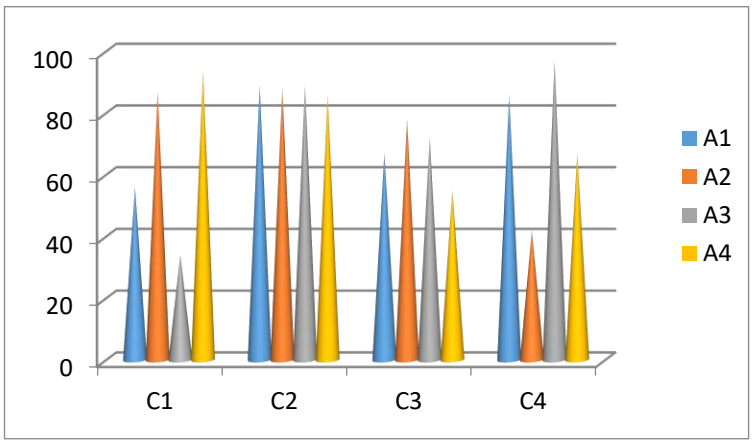

FIGURE 1. Data Set for SWARA

Figure 1. Shows that the value of dataset for Wise Weighted Assessment Ratio Analysis (SWARA) Alternative: Alternative is C1, C2, C3, C4. Rating Option: A1, A2, A3, and A4.

TABLE 2. Normalized Matrix for SWARA

	A1	**A2**	**A3**	**A4**
C1	0	0.9783	0	1
C2	1	1	0.873	0.79487
C3	0.33333	0.7826	0.6032	0
C4	0.90909	0	1	0.30769

Table 2 shows the values of normalized matrix for Wise Weighted Assessment Ratio Analysis (SWARA) using PROMETHEE. This value calculated from the dataset values.

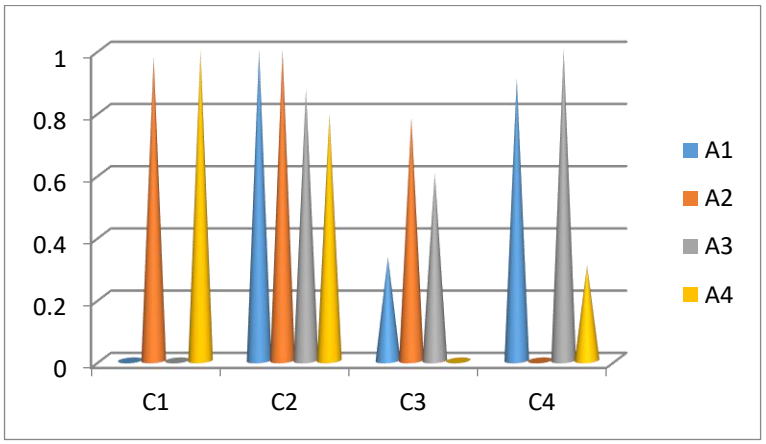

FIGURE 2. Normalized Matrix for SWARA

Figure 2 shows the values of normalized matrix for Wise Weighted Assessment Ratio Analysis (SWARA) using PROMETHEE.

TABLE 3. Pair wise Comparison for SWARA

	A1	**A2**	**A3**	**A4**
C1,2	-1	-0.0217	-0.873	0.20513
C1,3	-0.3333	0.1957	-0.603	1
C1,4	-0.9091	0.9783	-1	0.69231
C2,1	1	0.0217	0.873	-0.2051
C2,3	0.66667	0.2174	0.2698	0.79487

C2,4	0.09091	1	-0.127	0.48718
C3,1	0.33333	-0.1957	0.6032	-1
C3,2	-0.6667	-0.2174	-0.27	-0.7949
C3,4	-0.5758	0.7826	-0.397	-0.3077
C4,1	0.90909	-0.9783	1	-0.6923
C4,2	-0.0909	-1	0.127	-0.4872
C4,3	0.57576	-0.7826	0.3968	0.30769

Table 3 shows the values of pair wise comparison for offshore current power plant using PROMETHEE. Find Pair Wise Comparative Value for Biomedical Micro Electro Mechanical Systems (Biomems), Nanotechnology, Biotechnology, Biomedical Engineering.

TABLE 4. Preference Value for SWARA

	0.2336	0.165	0.3355	0.102	
C1,2	0	0	0	0.021	0.020944
C1,3	0	0.032	0	0.102	0.134422
C1,4	0	0.162	0	0.071	0.232293
C2,1	0.2336	0.004	0.2929	0	0.530088
C2,3	0.1557	0.036	0.0905	0.081	0.363335
C2,4	0.0212	0.165	0	0.05	0.236177
C3,1	0.0779	0	0.2024	0	0.280232
C3,2	0	0	0	0	0
C3,4	0	0.129	0	0	0.129287
C4,1	0.2124	0	0.3355	0	0.547864
C4,2	0	0	0.0426	0	0.042603
C4,3	0.1345	0	0.1331	0.031	0.299047

This table 4 calculated the value of Preference Value for Wise Weighted Assessment Ratio Analysis (SWARA) using PROMETHEE. Find preference value for Biomedical Micro Electro Mechanical Systems (BIOMEMS), Nanotechnology, Biotechnology, and Biomedical Engineering.

TABLE 5. Positive Negative value for SWARA

	A1	A2	A3	A4
C1	0	0.0209	0.1344	0.23229
C2	0.53009	0	0.3633	0.23618
C3	0.28023	0	0	0.12929
C4	0.54786	0.0426	0.299	0
Positive	1.35818	0.0635	0.7968	0.59776
Negative	0.27164	0.0127	0.1594	0.11955

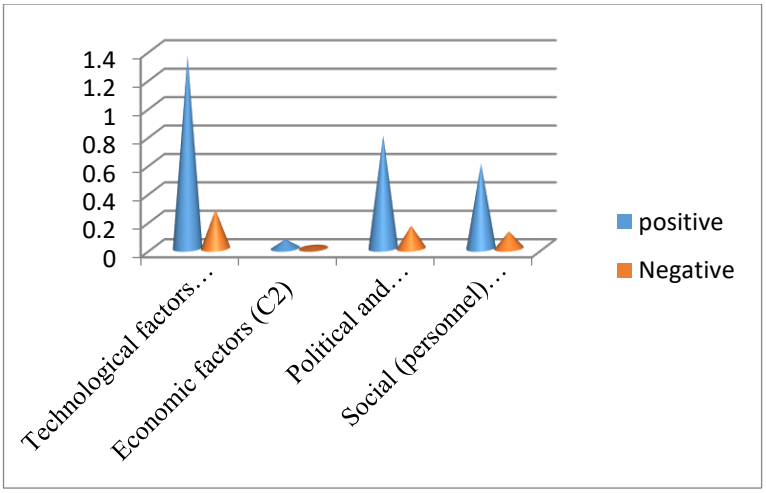

FIGURE 3. Positive Negative value for SWARA

Figure 3 shows the values of Positive and Negative for Wise Weight Assessment Ratio Analysis (SWARA) using PROMETHEE.

TABLE 6. Net flow and Rank

	Net flow	Rank
C1	1.08654	1
C2	0.0508	4
C3	0.6374	2
C4	0.47821	3

Table 6 from the result it is seen that Technological factors and is got the first rank whereas is the Economic factors got is having the lowest rank.

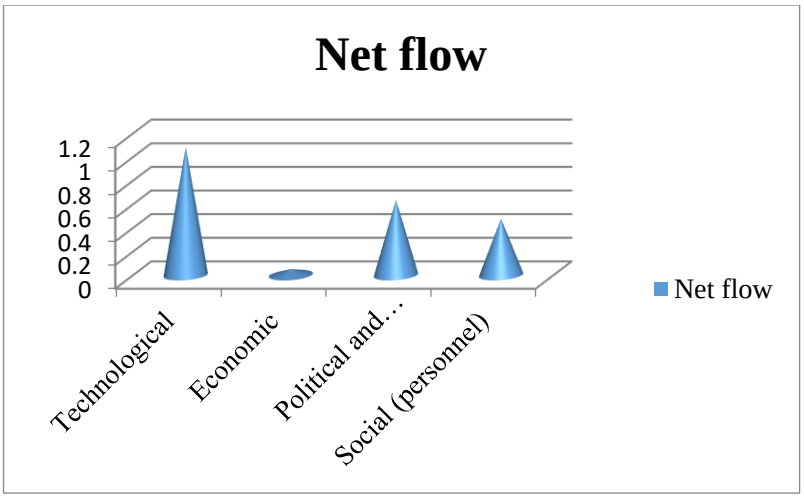

FIGURE 4. Net Flow

Figure 4 shows the values of Net flow for SWARA using PROMETHEE. Forth is (C1), first is (C2), third is (C3), second is (C4).

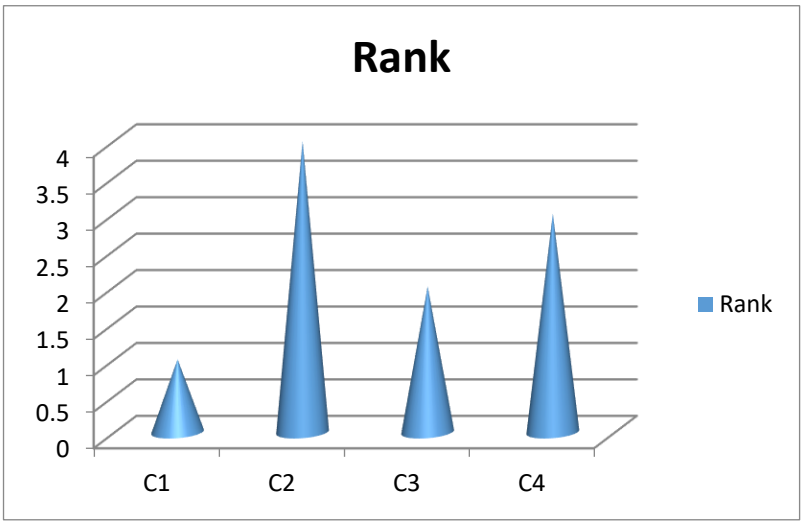

FIGURE 5. Rank

Figure 5. From the result it is seen that Technological factors (C1) and is got the first rank whereas is the Economic factors (C2) got is having the lowest rank.

Conclusion

This study Presented in extended version indicates the limitation of SWARA method. SWARA results how to trust and on the question of what experts can prove Answered in this paper. The SWARA method is one of the benefits, for multiple criteria

when priority is given It further revealed that its first step at the decision-making level (by selected experts). The providers with recent obscurities Theory and applications detailed overview development PROMETHEE application deterministic. Recently, papers related to PROMETHEE and SWARA have proliferated on many MCDM problems of PROMETHEE are SWARA approaches, and perform comparative analysis. Despite SWARA's popularity due to its clarity, precision and Ease of collaboration with experts, Based on SWARA In groundwater vulnerability assessment There is a research gap. Then other MCDM methods Because of its benefits. Enrichment Evaluation (PROMETHEE) SWARA for Approaches and Using priority ranking methods introduced a hybrid technique; it was used Enterprise Resource Planning (ERP) system for evaluation. The PROMETHEE method was used to accept bad rice Validation of decision support system. PROMETHEE (Priority Ranking Method for Concentration Evaluation) Created by several criteria decision support system. [13]. in multicriteria analysis Compared to AHP (Analytic Hierarchy Process) Comparative results indicate that PROMETHEE has some robustness. This accuracy was obtained by comparing. In a check of 40 beneficiaries, only six beneficiaries were found to be non-compliant. PROMETHEE is based on the overall function of representing the "closeness to the ideal" created by the compromise programming system. Because of this Technical Factors (C1) ranked first, Whereas Economic Factors (C2) Low ranking.

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