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Combination of ROC and MFEP Methods on the Acceptance of Rainwater Gutter Installer

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Abstract. The services of building construction companies in today's modern era are increasingly in demand by the wider community to get the best building results. Installing a rainwater tap in a building is one of the most important parts to pay attention to so that consumers are not disappointed. Therefore, the head of a building construction company that offers services in this field must be careful in the process of accepting rainwater gutter installer. The criteria used to acceptance of rainwater gutter installerin this study consisted of insight, work experience, health, and age criteria. Data collection techniques used in this study were literature studies and field studies. In this study the authors apply the ROC and MFEP methods to obtain the decision making of acceptance of rainwater gutter installer. In the results of this study an alternative named Rudiasyah (0.427111) has the highest value compared to other alternatives. So in this study Rudiasyah became the most recommended alternative to be accepted as a rainwater gutter installer.

Keywords: Decision Support System, MFEP, Rainwater Gutter Installer, ROC.

1 Introduction

Building construction company services are currently in increasing demand by the wider community to get the best building results [1]. The installation of rainwater gutter in a building is one of the most important parts that must be considered so that consumers are not disappointed in the future [2]. Rain gutters function to make the flow of water from the roof of a house more well-directed so that water does not accumulate in unwanted places [3]. Therefore, building construction companies that offer rainwater gutter installation services must be careful in accepting new employees so they can make the maximum contribution. In the process of hiring employees as rainwater gutter installer, it is necessary to carry out several assessment criteria so that the results of the decisions made are right on target. The criteria for decision making in the process of accepted rainwater gutter installers, namely insight, work experience, health, and age.

In today's technological era, decision-making systems can be improved by using computerised systems, one of which is a decision support system [4–6]. A decision support system, commonly called SPK, is a system that supports the work of a manager or group of managers in solving semi-structured or unstructured problems by providing advice that leads to certain decisions, one of which is determining the best choice [7–9]. In previous study, SPK has been used by many researchers to solve various decision-making problems. In research conducted by Aris Susanto, SPK was applied to assess the quality of education and training of civil servant candidates [10]. In Ahmad Artyanto Saputra's research, SPK is used for selecting culinary business locations [11]. Aji Prasetya Wibawa in his research also uses SPK to solve problems related to determining recommendations for article acceptance [12].

In a decision support system there are many methods that can be applied to produce accurate and reliable decisions [13–17]. In this research, the Rank Order Centroid (ROC) and Multi-Factor Evaluation Process (MFEP) methods are applied for decision making in the acceptance of rainwater gutter installers. The use of the ROC and MFEP methods in this study was based on the results of related research by previous researchers who concluded that the two methods were able to work well in their respective functions to support the decision-making process with accurate and reliable results [18–21].

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2 Research Method

2.1 Research Stages

In this study, several stages were carried out to solve the problem of accepting rainwater gutter installer using a combination of the ROC (Rank Order Centroid) and Multi-Factor Evaluation Process (MFEP) methods, namely:

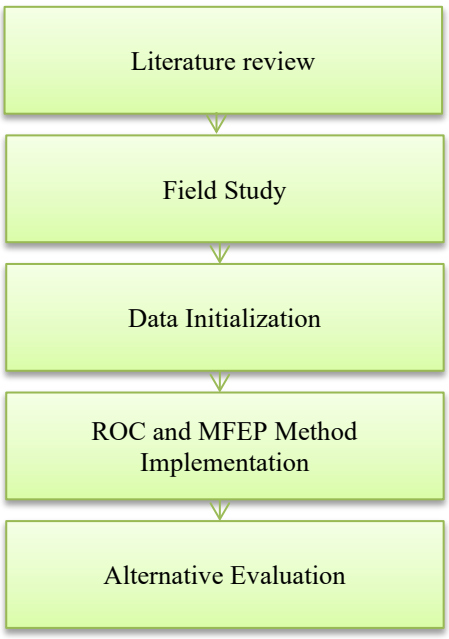

Figure 1. Research Stages

a. Literature review
In the early stages of this research, research materials were collected from journal articles related to the topics discussed in this study.
b. Field Study
In the second stage of this research, sample data was collected related to the reception of rainwater gutters installer from the intended research location.
c. Data Initialization
In the third research stage, the process of initializing sample data related to the acceptance of rainwater gutters istaller is carried out into alternative data and criteria data.
d. ROC and MFEP Method Implementation
In this fourth stage, the implementation of the Rank Order Centroid (ROC) method is carried out as a criterion weighting and the Multi-Factor Evaluation Process (MFEP) to determine alternative ranking results in the process of accepting rainwater gutters installer.
e. Alternative Evaluation
In the final stage the authors evaluate the decision-making results obtained based on a combination of ROC and MFEP methods. The alternative evaluation results provide information related to the conclusions on the alternative ranking results in the process of accepting rainwater gutters installer in this study.

2.2 Rank Order Centroid (ROC) Method

The ROC (Rank Order Centroid) method is a method commonly used to give objective weight values to each criterion based on the evaluation rating of the importance of each criterion [18]. In the ROC (Rank Order Centroid) method, several simple steps are carried out to calculate the weight values of all criteria as shown in the following figure [21]:

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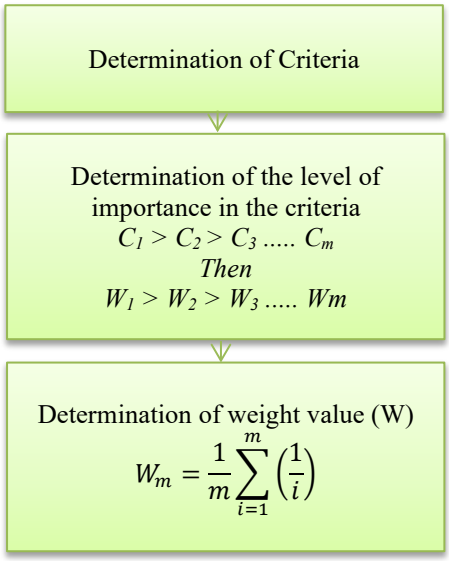

Figure 2. Rank Order Centroid (ROC) Method

2.3 Multi-Factor Evaluation Process (MFEP) Method

Multifactor Evaluation Process (MFEP) is a decision-making method that uses a subjective weighting system by considering the many factors that affect the value of each alternative [19,22]. The stages of decision making using MFEP can be seen in the image below:

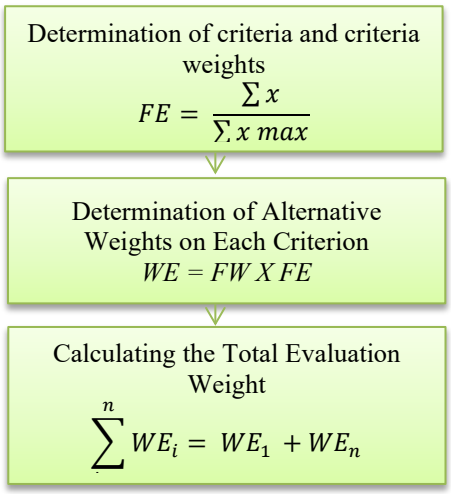

Figure 3. Multifactor Evaluation Process (MFEP) Method

3 Result and Discussion

3.1 Research Data Results

Based on the results of the research data collection that has been carried out, the data for the acceptance of rainwater gutter installer are shown in the following table:

Table 1. Acceptance Criteria for Rainwater Gutter Installers

Code	Criteria	Priority Weight
C001	Namely Insight	2
C002	Work Experience	3
C003	Health	1
C004	Age	4

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Table 2. Subcriteria for Acceptance of Rainwater Gutters Installer

Code	Criteria	Subcriteria	Priority Weight
C001	Namely Insight	Very Good (VG)	1
		Good (G)	2
		Enough (E)	3
C002	Work Experience	Very Good (VG)	1
		Good (G)	2
		Enough (E)	3
C003	Health	Very Good (VG)	1
		Good (G)	2
		Enough (E)	3
C004	Age	Very Good (VG)	1
		Good (G)	2
		Enough (E)	3

Table 3. Sampel Data Peneriaan Tukang Talang Air Hujan

No	Alternative	Kriteria			
		C001	C002	C003	C004
1	Alexander (A001)	E	G	VG	E
2	Santoso (A002)	VG	E	G	VG
3	Fajar Ahmad (A003)	G	VG	E	G
4	Eko Sulistyo (A004)	E	G	G	E
5	Rudiasyah (A005)	VG	G	E	G
6	Joko (A006)	G	E	G	G

3.2 Combination of ROC and MFEP Methods

The results of the decision making for accepting rainwater gutters installer using a combination of the ROC and MFEP methods, namely:

A. Determination of criteria and criteria weights

Based on the information in Table 1, it has been determined that for decision making on the acceptance of rainwater gutters installer, several criteria are used with different priority weights, namely Health criteria with the main priority weight, Insight criteria with the second priority weight, Work Experience criteria with the third priority weight, and the Age criterion for the last priority weight. Each assessment criterion used in the process of accepting rainwater gutters installer has a Very Good (SB) sub-criteria as the most priority sub-criteria, Good (Good) as the second priority sub-criteria, and Fair (C) for the last priority sub-criteria.

After determining the criteria and priority weights, the next step is to weight the criteria and sub-criteria for accepting rainwater gutters installer using the ROC method. The results of the weighting of the criteria and sub-criteria using the ROC method in this study are:

1. Determination of Criteria Weight

C001 weight = $\left(\frac{1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{4}\right)$ = 0,521

C002 weight = $\left(\frac{0+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}}{4}\right)$ = 0,271

C003 weight = $\left(\frac{0+0+\frac{1}{3}+\frac{1}{4}}{4}\right)$ = 0,146

C004 weight = $\left(\frac{0+0+0+\frac{1}{4}}{4}\right)$ = 0,062

2. Determination of Weight for Subcriteria C001, C002, C003, and C004

VG Subcriteria Weight = $\left(\frac{1+\frac{1}{2}+\frac{1}{3}}{3}\right)$ = 0,611

G Subcriteria Weight = $\left(\frac{0+\frac{1}{2}+\frac{1}{3}}{3}\right)$ = 0,278

E Subcriteria Weight = $\left(\frac{0+0+\frac{1}{3}}{3}\right)$ = 0,111

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Based on the weighting value of the criteria and sub-criteria weighting above, the value of each alternative in Table 3 is converted to as shown in the table below:

Table 4. Sample Data of Rainwater Gutter Installer Based on ROC Method Weighting

No	Alternative	Criteria			
		C001	C002	C003	C004
1	Alexander (A001)	0,111	0,278	0,611	0,111
2	Santoso (A002)	0,611	0,111	0,278	0,611
3	Fajar Ahmad (A003)	0,278	0,611	0,111	0,278
4	Eko Sulistyo (A004)	0,111	0,278	0,278	0,111
5	Rudiasyah (A005)	0,611	0,278	0,111	0,278
6	Joko (A006)	0,278	0,111	0,278	0,278

B. Determination of Alternative Weights on Each Criterion

At this stage, the process of determining alternative weight values for each criterion is carried out. As for the results of determining the weight value for each alternative on each acceptance criterion of rainwater gutters installer in this study, namely:

1. C001
   WE_{A001} = 0,521 * 0,111 = 0,057831
   WE_{A002} = 0,521 * 0,611 = 0,318331
   WE_{A003} = 0,521 * 0,278 = 0,144838
   WE_{A004} = 0,521 * 0,111 = 0,057831
   WE_{A005} = 0,521 * 0,611 = 0,318331
   WE_{A006} = 0,521 * 0,278 = 0,144838
2. C002
   WE_{A001} = 0,271 * 0,278 = 0,075338
   WE_{A002} = 0,271 * 0,111 = 0,030081
   WE_{A003} = 0,271 * 0,611 = 0,165581
   WE_{A004} = 0,271 * 0,278 = 0,075338
   WE_{A005} = 0,271 * 0,278 = 0,075338
   WE_{A006} = 0,271 * 0,111 = 0,030081
3. C003
   WE_{A001} = 0,146 * 0,611 = 0,089206
   WE_{A002} = 0,146 * 0,278 = 0,040588
   WE_{A003} = 0,146 * 0,111 = 0,016206
   WE_{A004} = 0,146 * 0,278 = 0,040588
   WE_{A005} = 0,146 * 0,111 = 0,016206
   WE_{A006} = 0,146 * 0,278 = 0,040588
4. C004
   WE_{A001} = 0,062 * 0,111 = 0,006882
   WE_{A002} = 0,062 * 0,611 = 0,037882
   WE_{A003} = 0,062 * 0,278 = 0,017236
   WE_{A004} = 0,062 * 0,111 = 0,006882
   WE_{A005} = 0,062 * 0,278 = 0,017236
   WE_{A006} = 0,062 * 0,278 = 0,017236

C. Calculating the Total Evaluation Weight

At this stage, the process of calculating the total value of the evaluation weight is carried out based on the results of calculating alternative weight values for each criterion that has been done before. The results of calculating the total value of the evaluation weight for the acceptance of rainwater gutters installer in this study, namely:

1. A001
$$\sum_{i=1}^{n} WE_{A001} = 0{,}057831 + 0{,}075338 + 0{,}089206 + 0{,}006882 = 0{,}229257$$
2. A002
$$\sum_{i=1}^{n} WE_{A002} = 0{,}318331 + 0{,}030081 + 0{,}040588 + 0{,}037882 = 0{,}426882$$

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3. A003

$$\sum_{i=1}^{n} WE_{A003} = 0{,}144838 + 0{,}165581 + 0{,}016206 + 0{,}017236 = 0{,}343861$$

4. A004

$$\sum_{i=1}^{n} WE_{A004} = 0{,}057831 + 0{,}075338 + 0{,}040588 + 0{,}006882 = 0{,}180639$$

5. A005

$$\sum_{i=1}^{n} WE_{A005} = 0{,}318331 + 0{,}075338 + 0{,}016206 + 0{,}017236 = 0{,}427111$$

6. A006

$$\sum_{i=1}^{n} WE_{A006} = 0{,}144838 + 0{,}030081 + 0{,}040588 + 0{,}017236 = 0{,}232743$$

Based on the results of calculating the total evaluation weight value above, the following alternative ranking table is produced:

Table 5. Alternative Ranking

No	Alternative	Value	Rangking
1	Alexander (A001)	0,229257	5
2	Santoso (A002)	0,426882	2
3	Fajar Ahmad (A003)	0,343861	3
4	Eko Sulistyo (A004)	0,180639	6
5	Rudiasyah (A005)	0,427111	1
6	Joko (A006)	0,232743	4

Table 5 above shows that the highest score for all alternatives is owned by Rudiasyah (A005) with a total evaluation score of 0.427111. So the alternative chosen as a rainwater gutter installer using a combination of the ROC and MFEP methods in this study is Rudiasyah (A005).

4 Conclusion

a. The application of the ROC method to the MFEP method can produce objective criteria weight values.
b. The results of decision making with a combination of ROC and MFEP methods can solve the problem of accepting rainwater gutters installer quickly and accurately.
c. The alternative chosen in the process of accepting rainwater gutters installer using a combination of the ROC and MFEP methods in this study is Rudiasyah (A005).

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