

Selection of the Best Electronic Goods Supplier Using the MFEP Method

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Abstract. The selection of the best supplier to fulfil the needs of the store in the continuous sale of electronic goods requires a selectivity process using many factors, namely product quality, product price, service, and product delivery speed. However, the number of alternatives to be selected can make it difficult for decision makers to determine the best choice in the selection process. Therefore, a decision support system is needed to support decision making so that the selection of the best electronic goods supplier can be done easily and quickly. The decision-making method used to make accurate decision results on the decision support system for selecting the best supplier of electronic goods in this study is MFEP. The sample data used in this study consists of 6 (six) alternatives and 4 (four) criteria as a factor in determining alternative ranking results. In the final results of this study, it was concluded that the A4 alternative had the highest value (0.3758) compared to 5 (five) other alternatives, namely A6 (0.3544), A1 (0.3484), A3 (0.325), A2 (0.3136), and A5 (0.2828). So that alternative A4 is the most recommended alternative for decision makers to choose as a supplier of electronic goods.

Keywords: Best Electronic Goods Supplier, Decision Support System, MFEP

1 Introduction

Currently, electronic goods have become a necessity for the wider community. So that to fulfil the long-term procurement of electronic goods in an electronic store requires the best supplier. The selection of the best supplier to meet the needs of the store in the continuous sale of electronic goods requires a selectivity process using many factors, namely product quality, product price, service, and product delivery speed. However, the number of alternatives to be selected can make it difficult for decision makers to determine the best choice in the selection process. Therefore, a decision support system is needed to support decision making so that the selection of the best electronic goods supplier can be done easily and quickly.

A decision support system (DSS) is a computerised system that can be used as a support to determine the best choice among many options [1]–[4]. Decision support systems (DSS) can convert data into information as a result of decision making in solving semi-structured and unstructured problems [5]–[7].

In a support system it is necessary to apply relevant methods in order to produce accurate decision making. The decision-making method used to make accurate decision results on the decision support system for selecting the best supplier of electronic goods in this study is MFEP. MFEP or Multifactor Evaluation Process is a decision-making method that can subjectively and intuitively determine the best alternative choices [8], [9]. The MFEP method in its working system considers the importance of each factor that affects the alternatives [10][11]. Research related to the MFEP method used in this study includes solving the problem of superior class student selection. The results of this study concluded that MFEP can make it easier for the selection team to select students who are more worthy of being selected to join the accelerated class [12]. Other related research conducted by [13], MFEP method is applied as a decision-making method in order to select the best study programme student association. The results of this study concluded that the physics student association was chosen as the best alternative based on the calculation of the MFEP method against 18 available alternatives.

2 Research Method

2.1 Research Stages

This research process uses 4 (four) stages to solve the problem of selecting the best supplier of electronic goods using the MFEP method, namely starting the stage of collecting sample data and literacy related to decision-making steps using the MFEP method, calculating the MFEP method to determine the value of each alternative based on sample data, ranking alternatives based on the results of calculations using the MFEP method, and drawing conclusions from the results of the research that has been done. The picture of the research stages for solving the problem of selecting the best supplier of electronic goods using the MFEP method is:

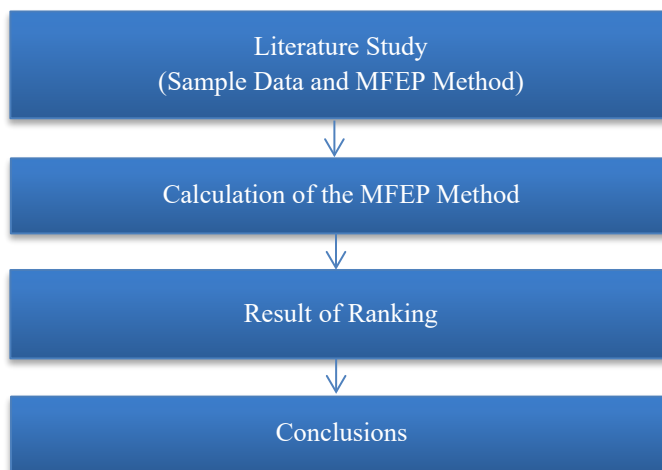


Figure 1. Research Stages

2.2 Sampel Data

The sample data used to solve the problem of selecting the best supplier of electronic goods using the MFEP method in this study, namely:

Table 1. Criteria for Selection of the Best Supplier of Electronic Goods

Code	Criteria	Weight (%)
SV	Product Quality	28
PP	Product Price	26
PW	Service	24
PDS	Product Delivery Speed	22

Table 2. Sub Criteria for Selection of the Best Electronic Goods Supplier

Code	Criteria	Sub Criteria	Weight (%)
SV	Product Quality	Height	39
		Medium	35
		Low	26
PP	Product Price	Low	39
		Medium	34
		Height	27
PW	Service	Good	38
		Enough	34
		Bad	28
PDS	Product Delivery Speed	One day	38
		Two days to four days	33
		More than four days	29

Table 3. Best Alternative Data for Electronic Goods Suppliers

Alternative	Criteria			
	SV	PP	PW	PDS
A1	Height	Medium	Bad	One day
A2	Medium	Height	Enough	Six days
A3	Low	Medium	Good	Three days
A4	Height	Low	Enough	One day
A5	Low	Height	Bad	Four days
A6	Medium	Low	Good	Five days

2.3 MFEP Method

MFEP or Multifactor Evaluation Process is a decision-making method that can subjectively and intuitively determine the best alternative choices [8], [9]. The MFEP method in its working system considers the importance of each factor that affects the alternatives [10][11]. The stages carried out in the MFEP method to determine the selection of the best alternative can be seen in Figure 2 below [14][15]:

- a. Calculating the Factor Weight Value (Total Factor Weight Value is 1 (One)).
- b. Calculate the Evaluation Weight Value using the provisions below:

$$NBE = NBF * NEF \tag{1}$$

Description:

- 1) NBF = Value of Factor Weight
- 2) NEF = Value of Factor Evaluation

- c. Calculate the Total Evaluation Weight value using the provisions below:

$$TBE = \sum NBE \tag{2}$$

1) Description:

- 2) TBE = Total Evaluation Weight Value

3 Results And Discussion

The results of decision making on solving the problem of selecting the best supplier of electronic goods using the MFEP method in this study can be seen in the description below:

3.1 Value of Factor Weight

The results of the calculation of the weight value of factors that affect the assessment of all alternatives for selecting the best electronic goods supplier using the MFEP method in this study, namely:

- a. Weight of Criteria and Sub-Criteria for Selection of the Best Supplier of Electronic Goods
 The weights of the criteria and sub-criteria used as factors for determining the results of selecting the best supplier of electronic goods using the MFEP method in this study can be seen in the following table:

Table 4. Weight Value of Best Electronic Goods Supplier Selection Criteria

Code	Criteria	Weight
SV	Product Quality	0,28
PP	Product Price	0,26
PW	Service	0,24
PDS	Product Delivery Speed	0,22
Total Criteria Weight Value		1

Table 5. Weight Value of Best Electronic Goods Supplier Selection Sub Criteria

Code	Criteria	Sub Criteria	Weight
SV	Product Quality	Height	0,39
		Medium	0,35
		Low	0,26
	Total Weight Value of SV Sub Criteria		1
PP	Product Price	Low	0,39
		Medium	0,34
		Height	0,27
	Total Weight Value of PP Sub Criteria		1
PW	Service	Good	0,38
		Enough	0,34
		Bad	0,28
	Total Weight Value of PW Sub Criteria		1
PDS	Product Delivery Speed	One day	0,38
		Two days to four days	0,33
		More than four days	0,29
	Total Weight Value of PDS Sub Criteria		1

b. Alternative Weights on the Selection of the Best Electronic Goods Supplier

The alternative weight values used as factors for determining the results of selecting the best electronic goods supplier using the MFEP method in this study can be seen in the following table:

Table 6. Weight Value of Best Alternative Supplier of Electronic Goods

Alternative	Criteria			
	SV	PP	PW	PDS
A1	0,39	0,34	0,28	0,38
A2	0,35	0,27	0,34	0,29
A3	0,26	0,34	0,38	0,33
A4	0,39	0,39	0,34	0,38
A5	0,26	0,27	0,28	0,33
A6	0,35	0,39	0,38	0,29

3.2 Evaluation Weight Value

The results of the calculation of the Evaluation Weight Value for determining the results of selecting the best electronic goods supplier using the MFEP method in this study can be seen in the following description:

- a. SV Evaluation Weight Value
 - $NBE_{A1} = 0,28 * 0,39 = 0,1092$
 - $NBE_{A2} = 0,28 * 0,35 = 0,098$
 - $NBE_{A3} = 0,28 * 0,26 = 0,0728$
 - $NBE_{A4} = 0,28 * 0,39 = 0,1092$
 - $NBE_{A5} = 0,28 * 0,26 = 0,0728$
 - $NBE_{A6} = 0,28 * 0,35 = 0,098$
- b. PP Evaluation Weight Value
 - $NBE_{A1} = 0,26 * 0,34 = 0,0884$
 - $NBE_{A2} = 0,26 * 0,27 = 0,0702$
 - $NBE_{A3} = 0,26 * 0,34 = 0,0884$
 - $NBE_{A4} = 0,26 * 0,39 = 0,1014$
 - $NBE_{A5} = 0,26 * 0,27 = 0,0702$
 - $NBE_{A6} = 0,26 * 0,39 = 0,1014$
- c. PW Evaluation Weight Value
 - $NBE_{A1} = 0,24 * 0,28 = 0,0672$
 - $NBE_{A2} = 0,24 * 0,34 = 0,0816$

$$\begin{aligned} NBE_{A3} &= 0,24 * 0,38 = 0,0912 \\ NBE_{A4} &= 0,24 * 0,34 = 0,0816 \\ NBE_{A5} &= 0,24 * 0,28 = 0,0672 \\ NBE_{A6} &= 0,24 * 0,38 = 0,0912 \end{aligned}$$

d. PDS Evaluation Weight Value

$$\begin{aligned} NBE_{A1} &= 0,22 * 0,38 = 0,0836 \\ NBE_{A2} &= 0,22 * 0,29 = 0,0638 \\ NBE_{A3} &= 0,22 * 0,33 = 0,0726 \\ NBE_{A4} &= 0,22 * 0,38 = 0,0836 \\ NBE_{A5} &= 0,22 * 0,33 = 0,0726 \\ NBE_{A6} &= 0,22 * 0,29 = 0,0638 \end{aligned}$$

3.3 Total Weight of Evaluation

The results of the calculation of the Total Weight Evaluation value carried out to determine the results in selecting the best electronic goods supplier using the MFEP method can be seen in the following description:

a. A1

$$\sum_{i=1}^n TBE_{A1} = 0,1092 + 0,0884 + 0,0672 + 0,0836 = 0,3484$$

b. A2

$$\sum_{i=1}^n TBE_{A2} = 0,098 + 0,0702 + 0,0816 + 0,0638 = 0,3136$$

c. A3

$$\sum_{i=1}^n TBE_{A3} = 0,0728 + 0,0884 + 0,0912 + 0,0726 = 0,325$$

d. A4

$$\sum_{i=1}^n TBE_{A4} = 0,1092 + 0,1014 + 0,0816 + 0,0836 = 0,3758$$

e. A5

$$\sum_{i=1}^n TBE_{A5} = 0,0728 + 0,0702 + 0,0672 + 0,0726 = 0,2828$$

f. A6

$$\sum_{i=1}^n TBE_{A6} = 0,098 + 0,1014 + 0,0912 + 0,0638 = 0,3544$$

After calculating the Total Weight Evaluation value, the ranking process is carried out for all alternatives considered in selecting the best electronic goods supplier in this study. Ranking is done based on the best alternative whose value is higher than the value of other alternatives. Based on the results of the calculation of the Total Weight Evaluation value above, an alternative ranking table can be produced in selecting the best supplier of electronic goods below:

Table 7. Ranking of Alternatives

Ranking	Alternative	Value
1	A4	0,3758
2	A6	0,3544
3	A1	0,3484
4	A3	0,325
5	A2	0,3136
6	A5	0,2828

Based on the information shown in Table 7 above, it can be seen that the MFEP method results in ranking the best electronic goods supplier selection alternatives based on the largest value. The best alternative supplier of electronic goods determined based on the calculation of the MFEP method in this study is A4 with a value of 0.3758. In the next alternative ranking position, namely, A6 (0.3544), A1 (0.3484), A3 (0.325), A2 (0.3136), and A5 (0.2828).

4 Conclusion

Based on the results of the implementation of the MFEP method that has been carried out to solve the problem of selecting the best supplier of electronic goods in this study, the following conclusions can be described:

- a. The MFEP method can produce subjective alternatives ranking to determine the best alternative using Product Quality, Product Price, Service, and Product Delivery Speed criteria.
- b. Alternative A4 has the highest value (0.3758) compared to the other 5 (five) alternatives, namely A6 (0.3544), A1 (0.3484), A3 (0.325), A2 (0.3136), and A5 (0.2828).
- c. Alternative A4 is the most recommended alternative to the decision maker to be selected as an electronic goods supplier.

Reference

- [1] E. H. Saputri, S. S. Hilabi, and A. Hananto, "Sistem Pendukung Keputusan Pemilihan Supplier Obat Menggunakan Metode Simple Additive Weighting," *J. Account. Inf. Syst.*, vol. 6, no. 2, 2023.
- [2] Z. N. Arif and L. Bachtiar, "Analisis Perbandingan Sistem Pendukung Keputusan Menggunakan Metode Smart Dan Profile matching Pemilihan Supplier Vapor," vol. 17, no. 1, pp. 111–122.
- [3] A. Yusupa, J. Manullang, N. Marbun, S. Bill, and F. Ginting, "Decision Support System for Determining the Best PAUD Teacher Using the MOORA Method," vol. 1, no. 2, pp. 50–55, 2023, doi: 10.58905/SAGA.vol1i2.101.
- [4] A. Susanto, O. Wahid, Hazriani, and Yuyun, "Decision support system on quality assessment of the prospective civil servant's education and training using fuzzy method," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 24, no. 1, pp. 519–529, 2021, doi: 10.11591/ijeecs.v24.i1.pp519-529.
- [5] R. R. Hadistio, H. Mawengkang, and M. Zarlis, "Application of The MOORA Method and Rank Order Centroid for Admission Recommendation System Power Programmer," *CESS (Journal Comput. Eng. Syst. Sci.)*, vol. 7, no. 1, p. 253, 2022, doi: 10.24114/cess.v7i1.29686.
- [6] Fajriyah Mayzura Agustin, I. D. Wijaya, and B. Harijanto, "Sistem Pendukung Keputusan Pemilihan Situs Lowongan Kerja Menggunakan Metode Moora," *J. Inform. Polinema*, vol. 9, no. 4, pp. 487–492, 2023, doi: 10.33795/jip.v9i4.1422.
- [7] R. Suheri and A. Mulyani, "Penerapan Metode Weighted Product Untuk Pemilihan Karyawan Terbaik Di Pt.Anugrah Abadi Baru," *JISAMAR (Journal Inf. Syst. Applied, Manag. Account. Res.)*, vol. 7, no. 1, pp. 85–193, 2023, doi: 10.52362/jisamar.v7i1.1033.
- [8] L. Veranica, Sapri, and D. Sartika, "Sistem Pendukung Keputusan Penempatan Pegawai Yang Akan Dipromosikan Menggunakan Metode Multifactor Evaluation Process Pada Kantor Bkpsdm Kabupaten Lebong," vol. 4307, no. June, pp. 328–334, 2023.
- [9] I. R. Rahadjeng, M. N. H. Siregar, and A. P. Windarto, "Pemanfaatan Sistem Keputusan Dalam Mengevaluasi Penentuan Aplikasi Chatting Terbaik Dengan Multi Factor Evaluation Process," *J. Media Inform. Budidarma*, vol. 6, no. 2, p. 1258, 2022, doi: 10.30865/mib.v6i2.4021.
- [10] D. T. Savra, N. Nabilah, I. Ramadhani, A. Syahroni, and P. H. Noprita, "Implementasi Algoritma Multi Factor Evaluation Process (MFEP) untuk Penentuan Calon Peserta Didik Baru pada Yayasan Baabussalam," *MALCOM Indones. J. Mach. Learn. Comput. Sci.*, vol. 2, no. 2, pp. 53–60, 2022, doi: 10.57152/malcom.v2i2.428.
- [11] R. R. Hidayatullah, S. Sumijan, and Y. Yunus, "Accuracy in Identifying Talent for Advanced Students Using the Multifactor Evaluation Process (MFEP) Method," *J. Inf. dan Teknol.*, vol. 2, pp. 151–155, 2020, doi: 10.37034/jidt.v2i4.112.
- [12] L. Syafina and C. B. Harahap, "Penerapan Metode Multifactor Evaluation Process (MFEP) Dalam Sistem Pendukung Keputusan Seleksi Siswa Kelas Unggulan Pada SMKS Sinar Husni 2 TR," no. 1, pp. 252–267, 2023.

- [13] E. R. Erni Rouza, B. Basorudin, and Y. Yulaini, "Implementasi Multi Factor Evaluation Process (Mfep) Berbasis Web Untuk Pemilihan Hmp Terbaik," *Zo. J. Sist. Inf.*, vol. 5, no. 2, pp. 358–371, 2023, doi: 10.31849/zn.v5i2.13764.
- [14] S.- Supiyandi, A. P. U. Siahaan, and A. Alfiandi, "Sistem Pendukung Keputusan Pemilihan Pegawai Honorer Kelurahan Babura dengan Metode MFEP," *J. Media Inform. Budidarma*, vol. 4, no. 3, p. 567, 2020, doi: 10.30865/mib.v4i3.2107.
- [15] M. A. Lubis, "Implementasi Metode Multyfactor Evaluation Process (Mfep) Pemberian Penghargaan Desa Bersinar," *JATISI (Jurnal Tek. Inform. dan Sist. Informasi)*, vol. 9, no. 3, pp. 2461–2471, 2022, doi: 10.35957/jatisi.v9i3.2753.