

Assessment of the President of BEM Using the Weighted Product Method at XYZ University

Tundo¹, Agung Yuliyanto Nugroho², Andi Saidah³

¹Teknik Informatika, Sekolah Tinggi Ilmu Komputer Cipta Karya Informatika (STIKOM CKI), Indonesia

²Informatika, Universitas Cendekia Mitra Indonesia, Indonesia

³Teknik Mesin, Universitas 17 Agustus 1945 Jakarta, Indonesia

¹asna8mujahid@gmail.com*, ²agungyuliyanto@unicimi.ac.id, ³andi.saidah@uta45jakarta.ac.id

Abstract. The election of the BEM President is a hereditary tradition at XYZ University every year. This election was carried out to find a leader who has a firm personality and broad insight. As the number of students at XYZ University increased, we doubled the election using the Weighted Product (WP) method with the conditions that we had determined with the campus. So we are sure that this method will produce the leaders we expect, and also in this way the campus automatically saves budget for voting or direct elections. The WP method which is quantitative in decision making, the WP method uses multiplication to link attribute ratings, where the rating of each attribute must be raised to the first power of the attribute weight in question. By applying the WP method to decision support system, then implementing it into a ranking system, it will produce students who deserve to become BEM in the next period. There is a WP method at XYZ University in order to get a BEM President who meets the criteria we set. Where the existing criteria consist of TPA criteria, Liveliness, Commitment, GPA, Absent, and Age. After calculating using the WP method, it was found that the strongest student who deserved to be president of BEM was Siti Munawaroh who was ranked first. The results of the recommended method by conducting a questionnaire to the BEM management by producing an accuracy of 0.01356.

Keywords: BEM, Decision Support System, Election, Weighted Product.

Received January 2023 / **Revised** January 2025 / **Accepted** May 2025

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).



INTRODUCTION

The implementation of an honest and fair democracy is the main spirit in every implementation of an organization. One of the democratic processes in an organization is to conduct elections to determine a leader in an organization [1]. Various methods are carried out that aim to get maximum results and can present data transparently so that it can be monitored by all election participants involved. This democratic process requires a good management system so that the negative potential at the time of its implementation can be minimized [2]. The democratic process carried out on campus in conducting BEM presidential elections is carried out in the campus environment using computers that have applications that are used offline. By looking at the current pandemic conditions with the rapid development of information technology and greatly affecting all sectors of human life. So the idea arose to conduct the BEM presidential election using the Weighted product method with the terms and weights that we have agreed upon together.

The following are some similar studies that researchers took as material in making this research. First according to Research by [3], with the object of selecting the best flour in making vermicelli. The alternative data available are tapioca flour, sago flour, starch and corn flour, of the four flours, which are the best for making vermicelli, influenced by flour quality criteria, price, and flour brand. From the results of using the Weighted Aggregated Sum Product Assessment (WASPAS) method, it was found that corn flour had the highest value, namely 6.13, so corn flour was a suitable alternative for making vermicelli.

Research by [4], with the object of determining the best wood in the manufacture of guitar materials. Alternative data available are rosewood, maple, poplar, mahogany, basswood, alder, and ash, of the seven woods, which are the best to be used as guitar materials influenced by the criteria of wood type, wood grain, wood texture and weight. From the results of using the Weighted Aggregated Sum Product Assessment (WASPAS) method, it was found that ash wood had the highest value, namely 5,067, so ash wood is a feasible alternative to use in making guitar materials. Then by

[5], with kindergarten selection objects. The existing alternative data, namely, kindergartens in Kunjang Samarinda District, in the study provided examples A1, A2, A3, A4, and up to A28 which would be selected as the best kindergartens in the District, influenced by location criteria, tuition fees, entrance fees, facilities, class capacity limits, number of teachers per class, kindergarten accreditation, kindergarten status, accepting children with special needs. From the results of using the Weighted Product (WP) method, it was found that Kindergarten A14 had the highest score, namely 0.0438, so Kindergarten A14 was a feasible alternative to be chosen as the best kindergarten.

Finally, by [6], with the customer prospect object for sales marketing. The existing alternative data, namely local companies, in the study provided examples A1, A2, A3, A4, up to A12 which had prospects as companies that were influenced by the criteria for length of visit, page views, reflections, visits, media, and sources. From the results of using the WP method, it was found that company A5 had the highest value, namely 0.01524, so company A5 was a prospective alternative to be selected.

Based on this, here the author tries to make an idea or idea that aims to avoid fraud or subjectivity factors by making research or recommendations in determining the right BEM chairman using the WASPAS WP method based on TPA criteria, Liveliness, Commitment, GPA, Absent, and Age. The basic concept of both methods is to find the best alternative results using the ranking concept.

METHODS

The research process for determining students who are worthy of being BEM chair at XYZ campus in stages is shown in Figure 1.

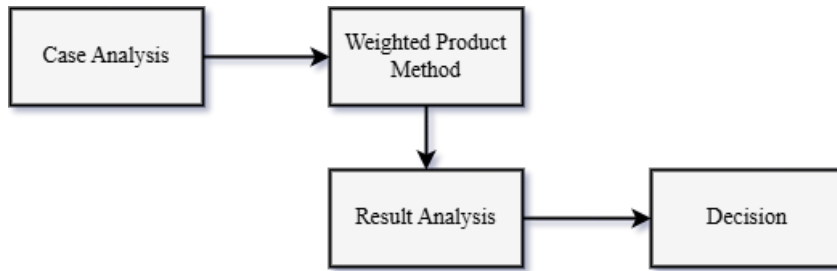


Figure 1. Methods

Case Analysis

The analysis is carried out directly to the student administrator concerned. Student administrators in determining the presidential candidates of the BEM campus are still very subjective, which means that the campus BEM presidential candidates are selected based on their assessment and even then the candidates chosen are from the BEM management itself, regardless of the talents of other students, who are from outside the management. Based on this problem, researchers want to try to make research in determining BEM presidential candidates using the Weighted Product (WP) method, with the aim of reducing subjectivity [7] in determining BEM presidential candidates by involving all students.

Weighted Product Method

Weighted Product (WP) is one of the decision support system methods, where multiplication is used to correlate attribute ratings, and the rating of each attribute must first be raised to the rank of the corresponding attribute weight [3],[8]. WP method steps, namely:

- Determine the relevant criteria to be used as a reference in making decisions.
- Specifies the set of each criterion into a matching rating value in the form of weighting.
- Perform an improvement in the weight value of each criterion with the formula:

$$w_j = \frac{w}{\sum w} \quad (1)$$

- Specify a preference value for the S_i alternative with the formula:

$$s_i = \prod_j^n x_{ij}^{w_j} \quad (2)$$

- e. Perform an improvement in the weight value of each criterion with the formula:

$$V_i = \frac{S_i}{\sum_{j=1}^n (x_{*j})^{w_j}} \quad (3)$$

Result Analysis

Analysis of results is carried out by conducting questionnaires to students and campus administrators, in order to provide an assessment of the results of recommendations, using the formula [9]:

$$Accuracy = \frac{N}{N+N_i} \times 100\% \quad (4)$$

RESULT AND DISCUSSION

The process of determining students who are worthy of being BEM chair at XYZ campus using the Weighted Product (WP) method in stages can be seen in Figure 2, where the WP method calculation process in this research uses Microsoft Excel.

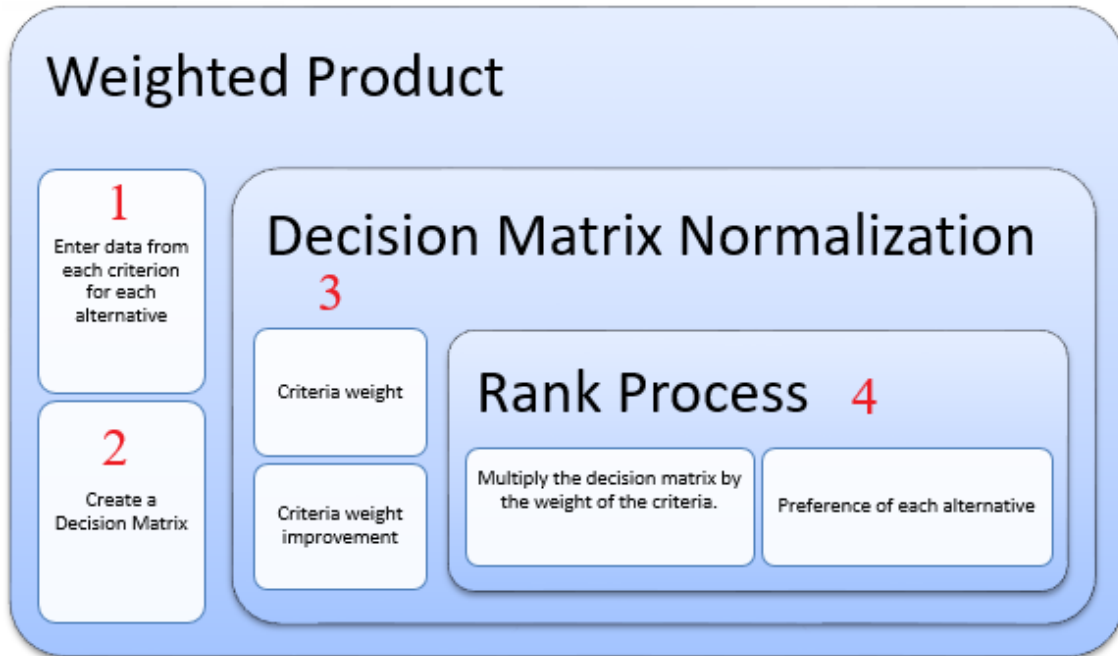


Figure 2. Weighted Product Methods

The first step in applying the Weighted Product (WP) method for the determination of BEM presidents is to determine the criteria accompanied by weighting [10],[11]. The criteria and weight scores obtained from the campus in question are shown in Table 1. Criterion.

Table 1. Criteria

Criteria	Resistance	Attributes	Weight
C1	TPA	Benefit	20
C2	Liveliness	Benefit	20
C3	Commitment	Benefit	20
C4	GPA	Benefit	20
C5	Absent	Cost	10
C6	Age	Cost	10

Then, the second step is to determine the set of each criterion [12],[13]. The set value of each criterion is derived from mutual agreement. Shown in Table 2. The set of criteria below.

Table 2. The set of criteria			
Criteria	Resistance	Set	Value
C1	TPA	>539	5
		500-538	4
		450-499	3
		400-449	2
		<400	1
C2	Liveliness	Active	3
		Not Active	2
		Passive	1
C3	Commitment	Very committed	5
		Commitment	4
		Enough committed	3
		Less	2
		Not Committed	1
C4	GPA	>2.8	3
		2.5-2.8	2
		<2.5	1
C5	Absent	> 10 days	3
		5 - 9 days	2
		< 5 days	1
C6	Age	> 24 years	3
		22 - 24 years	2
		19 - 21 years	1

After the criteria and set of each criterion are determined, the next alternative data in the study is the name of the student [14]. Shown in Table 3. Alternative.

Table 3. Alternative	
Alternative	Name
A1	Aditya Surya Risnanto
A2	Asmarantara Pala
A3	Muzaki Fadkhul Ibadi
...	...
...	...
...	...
A91	Kurniawan Sunu Aji Prasetyo
A92	Siti Husnaeni
A93	Yudiyono

The following student data is contained in an alternative table, which appears as in Table 4. The following student data.

Table 4. Student data

Alternative	C1	C2	C3	C4	C5	C6
A1	>539	Active	Very committed	>2.8	5 - 9 days	22- 24 years
A2	500-538	Passive	Commitment	2.5-2.8	5 - 9 days	19 - 21 years
A3	500-538	Passive	Very committed	2.5-2.8	< 5 days	19 - 21 years
...
...
...
A91	500-538	Not Active	Very committed	2.5-2.8	5 - 9 days	22- 24 years
A92	500-538	Not Active	Commitment	2.5-2.8	5 - 9 days	22- 24 years
A93	500-538	Active	Very committed	>2.8	5 - 9 days	22- 24 years

Next change Table 4. Student data into the form of weighting according to the values contained in Table 2. The set of criteria, which appears in Table 5. Weighting data.

Table 5. Weighting Data

Alternative	C1	C2	C3	C4	C5	C6
A1	5	3	5	3	2	2
A2	4	1	4	2	2	1
A3	4	1	5	2	1	1
...
...
...
A91	4	2	5	2	2	2
A92	4	2	4	2	2	2
A93	4	3	5	3	2	2

The calculation process uses the WP method, after forming a match rating or in this case the weighting seen in Table 5 [15]. Weighting Data, the next step is to improve the weight of each predetermined criterion using equations, namely:

$$W_1 = 20 / (20 + 20 + 20 + 20 + 10 + 10) = 0,2$$

$$W_2 = 20 / (20 + 20 + 20 + 20 + 10 + 10) = 0,2$$

$$W_3 = 20 / (20 + 20 + 20 + 20 + 10 + 10) = 0,2$$

$$W_4 = 20 / (20 + 20 + 20 + 20 + 10 + 10) = 0,2$$

$$W_5 = 10 / (20 + 20 + 20 + 20 + 10 + 10) = 0,1$$

$$W_6 = 10 / (20 + 20 + 20 + 20 + 10 + 10) = 0,1$$

So that the existing weights change to be as in Table 6. The following weight changes.

Table 6. Weight Change.

Criteria	W_i
C1	0,2
C2	0,2
C3	0,2
C4	0,2
C5	0,1
C6	0,1

The next step, which is to change the S_i vector where for the criteria in the benefit category then w_j in positive form, and when the criteria are in the cost category then w_j is in negative form using the equation, namely:

$$\begin{aligned} &A1 \\ &S1 = 5^{0,2} \times 3^{0,2} \times 5^{0,2} \times 3^{0,2} \times 2^{0,1} \times 2^{0,1} = 2.571 \\ &A2 \\ &S2 = 4^{0,2} \times 1^{0,2} \times 4^{0,2} \times 2^{0,2} \times 2^{0,1} \times 1^{0,1} = 1.866 \\ &A3 \\ &S3 = 4^{0,2} \times 1^{0,2} \times 5^{0,2} \times 2^{0,2} \times 1^{0,1} \times 1^{0,1} = 2.091 \\ &\dots \\ &\dots \\ &A91 \\ &S91 = 4^{0,2} \times 2^{0,2} \times 5^{0,2} \times 2^{0,2} \times 2^{0,1} \times 2^{0,1} = 2.091 \\ &A92 \\ &S92 = 4^{0,2} \times 2^{0,2} \times 4^{0,2} \times 2^{0,2} \times 2^{0,1} \times 2^{0,1} = 2 \\ &A93 \\ &S93 = 4^{0,2} \times 3^{0,2} \times 5^{0,2} \times 3^{0,2} \times 2^{0,1} \times 2^{0,1} = 2.459 \end{aligned}$$

From the results of the process of searching for the value of the change in the vector S_i above can be seen in full in Table 7. Vector changes

Table 7. Vector changes

Alternative	S_i
A1	2,57176
A2	1,866066
A3	2,091279
...	...
...	...
...	...
A91	2,091279
A92	2
A93	2,459509
Sum	194,7273

The next process calculates the value of the V_i preference for each alternative using the equation, as follows.

$$\begin{aligned} &A1 \\ &V1 = 2,57176 \div 194,7273 = 0,013217 \\ &A2 \\ &V2 = 1,866066 \div 194,7273 = 0,00959 \\ &A3 \\ &V3 = 2,091279 \div 194,7273 = 0,010748 \\ &\dots \\ &A91 \\ &V91 = 2,091279 \div 194,7273 = 0,010748 \\ &A92 \\ &V92 = 2 \div 194,7273 = 0,010279 \\ &A93 \\ &V93 = 2,459509 \div 194,7273 = 0,01264 \end{aligned}$$

The final result or ranking value of the calculation above can be seen in Table 8. Squealing.

Table 8. Ranking

Alternative	Name	Result	Rank
A84	Siti Munawaroh	0,01356	1
A1	Aditya Surya Risnanto	0,013229	2
A86	Tuti Khunaefa	0,012802	3
A16	Kharisma Khoerunnisa	0,012652	4

A63	Adestya Suci Utami	0,007829	91
A71	Masruri	0,007797	92
A87	Yuniarti	0,006949	93

CONCLUSION

It was found that the results of research using the Weighted Product (WP) method in determining XYZ campus students who were worthy of becoming BEM chairman, namely Siti Munawaroh, was ranked first from several alternative student choices. The results of the recommended method by conducting a questionnaire to BEM administrators produced an accuracy of 0.01356. This is in line with the results obtained from this method. There are suggestions for developing this research to make it even better by implementing a DSS design system using a database and programming language, because this research still uses Microsoft Excel, as well as making comparisons using other Decision Support System methods such as MOORA, SAW, AHP and similar, so that it is known that the recommended results will produce the same thing or different accuracy.

REFERENCES

- [1] T. Tundo, "Subjectivity Tracking System for Poor Scholarship Recipients at Elementary School Using the MOORA Method," *JTAM (Jurnal Teor. dan Apl. Mat.*, vol. 6, no. 3, pp. 498–510, 2022.
- [2] T. Tundo, "Penentuan Kandidat Lurah Pondok Menggunakan Metode Decision Support System Weighted Product," *J. CoreIT*, vol. 6, no. 2, pp. 96–102, 2020.
- [3] E. D. Marbun, L. A. Sinaga, R. Simanjuntak, D. Siregar, and J. Afriany, "Penerapan Metode Weighted Aggregated Sum Product Assessment Dalam Menentukan Tepung Terbaik Untuk Memproduksi Bihun," *J. Ris. Komput.*, vol. 5, no. 1, pp. 24–28, 2018.
- [4] P. Simanjuntak, I. Irma, N. Kurniasih, M. Mesran, and J. Simarmata, "Penentuan Kayu Terbaik Untuk Bahan Gitar Dengan Metode Weighted Aggregated Sum Product Assessment (WASPAS)," *J. Ris. Komput.*, vol. 5, no. 1, pp. 36–42, 2018.
- [5] S. Maharani, S. Hermawati, I. F. Astuti, H. R. Hatta, and D. M. Khairina, "Pemilihan Taman Kanak-kanak Menggunakan Metode Weighted Product di Kecamatan Sungai Kunjang Samarinda," *J. Teknol. Inf. dan Ilmu Komputer(JTIK)*, vol. 5, no. 4, 2018.
- [6] F. Pradana, F. A. Bachtar, M. Dearifaldi, and A. Ikhsan, "Implementasi Weighted Product Untuk Memberikan Rekomendasi Prospek Pelanggan Bagi Sales Marketing Berdasarkan Web Analytics Implementation Of Weighted Product To Provide Customer," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 7, no. 2, pp. 367–372, 2020.
- [7] P. Rani, A. R. Mishra, and K. R. Pardasani, "A novel WASPAS approach for multi-criteria physician selection problem with intuitionistic fuzzy type-2 sets," *Soft Comput.*, vol. 24, no. 3, pp. 2355–2367, 2020.
- [8] V. Amalia, D. Syamsuar, and L. Atika, "Komparasi Metode WP SAW dan WASPAS Dalam Penentuan Penerima Beasiswa Penelusuran Minat dan Kemampuan," *J. Inform.*, vol. 6, no. 1, pp. 114–121, 2019.
- [9] T. Tundo and D. Kurniawan, "Penerapan Metode Weighted Aggregated Sum Product Assesment dalam Menentukan Beras Terbaik untuk Pembuatan Kue Serabi," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 7, no. 4, pp. 773–778, 2020.
- [10] T. Tundo and S. 'Uyun, "Penerapan Decision Tree J48 dan Reptree dalam Menentukan Prediksi Produksi Minyak Kelapa Sawit menggunakan Metode Fuzzy Tsukamoto," *J. Teknol. Inf. dan Ilmu*

- Komput.*, vol. 7, no. 3, p. 483, 2020.
- [11] T. Tundo and D. Kurniawan, "Implementation of the Weighted Aggregated Sum Product Assesment Method in Determining the Best Rice for Serabi Cake Making," *IJID (International J. Informatics Dev.*, vol. 8, no. 1, p. 40, 2019.
 - [12] Tundo and S. Uyun, "Perbandingan Decision Tree J48 , Reptree , Dan Random Tree Dalam Menentukan Prediksi Produksi Minyak Kelapa Sawit Comparison of Decision Tree J48 , Reptree , and Tree Random in Determining the Prediction of Palm Oil Production Using the Fuzzy Tsukamoto Me," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 8, no. 3, pp. 473–484, 2021.
 - [13] T. Tundo and W. D. Nugroho, "Sistem Bantu Untuk Pengrajin Dalam Menentukan Kayu Terbaik Untuk Bahan Gitar Dengan Menggunakan Metode Moora," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 8, no. 6, pp. 1177–1186, 2021.
 - [14] A. R. Mishra and P. Rani, "Multi-criteria healthcare waste disposal location selection based on Fermatean fuzzy WASPAS method," *Complex Intell. Syst.*, vol. 7, no. 5, pp. 2469–2484, 2021.
 - [15] R. Bausys, G. Kazakeviciute-Januskeviciene, F. Cavallaro, and A. Usovaite, "Algorithm selection for edge detection in satellite images by neutrosophic WASPAS method," *Sustain.*, vol. 12, no. 2, 2020.