Zero : Jurnal Sains, Matematika, dan Terapan
E-ISSN : 2580-5754; P-ISSN : 2580-569X
Volume 10, Number 1, 2026
DOI: 10.30829/zero.v10i1.28629
Page: 289 - 302

A Hybrid Analytical Hierarchy Process (AHP) and Profile Matching Model for E-Wallet Selection Decisions in Medan City

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Article Info

Article history:

Accepted 22 April 2026

Keywords:

Analytical Hierarchy Process (AHP);
Decision Support System;
E-wallets;
Profile Matching;
Students.

ABSTRACT

The development of digital payments in Indonesia has increased the complexity of selecting an e-wallet that aligns with user preferences. This study proposes a hybrid DSS integrating AHP and Profile Matching, enhanced by a proportional transformation of AHP weights into ideal values. Unlike conventional approaches that subjectively determine ideal values, this method ensures consistency between criteria weighting and suitability evaluation, thereby reducing bias and improving ranking stability. Data from 100 students across four universities indicate that security dominates (46%), followed by convenience & access (25%), and features & cost (29%), indicating that risk reduction and trust are key adoption factors, in line with technology acceptance theory. OVO achieved the highest score. The hybrid framework reduces subjective bias in ideal-value assignment and improves ranking stability compared to standalone AHP or Profile Matching applications. These findings provide methodological contributions and practical implications for fintech providers.

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1. INTRODUCTION

The rapid advancement of information technology in the current digital era has brought about various innovations, including in the financial sector with the emergence of financial technology (fintech) services. The development of fintech increases transaction efficiency and plays a crucial role in driving digital economic growth and expanding financial inclusion, particularly in developing countries like Indonesia. The increased use of digital payments reflects a shift in consumer behavior toward cashless transaction systems, which has impacted broader economic structural transformation. This phenomenon is not limited to specific regions but reflects a broader global trend toward digital financial adoption, thereby strengthening the relevance and generalizability of this research context. One of the innovations most frequently used by the public is the e-wallet, or digital wallet, which allows users to make transactions quickly, practically, and safely [1]. Based on data from the Katadata Insight Center in 2023, it indicates that e-wallets are the most popular payment method in Indonesia, with a user percentage reaching 84.3%. The rapid development of digital payment systems is also evident in Southeast Asia. Previous research has shown that factors such as trust, convenience, and technological benefits play a significant role in influencing the adoption of e-wallet services[2]. In addition, the conceptual framework proposed in other studies highlights the role of technological readiness, user behavior, and institutional support in shaping mobile payment adoption in the Southeast Asia region[3]. With the many choices of e-wallet applications such as DANA, OVO, ShopeePay, GoPay, and LinkAja [4] has created a challenge for users in determining the most suitable application according to their needs. Each application possesses unique advantages and disadvantages, which are determined by various criteria such as security, features, transfer fees, and ease of access[5].

This problem encourages the need for a decision support system (DSS) capable of assisting users in selecting the best e-wallet based on multiple measurable factors[6]. A computer-based system serves as the decision-making system, aiding in the semi-structured decision making process and facilitating interactive decision-making[7][8]. DSS is often used in various fields involving problem identification, data collection, alternative analysis, solution selection, implementation of methods, and evaluation of results[9][10].

Previous studies, such as Ela et al. (2024), employed the Analytical Hierarchy Process (AHP) to determine the weighting of elements for e-wallet selection, utilising four alternatives and four criteria. However, they did not measure the suitability of these alternatives to the ideal conditions of the user[11]. Meanwhile, Rudi (2023), applied the Profile Matching to identify the most suitable e-wallet from the perspectives of convenience and security, but the study was still limited to the number of respondents and did not involve objective criteria weighting [12]. In another study, Amaliyah et al. (2023), combined AHP and Profile Matching, yet their application was confined to workforce recruitment rather than digital financial services [13].

Based on the research gaps identified in previous studies, this study formulates the following research questions:

a. To what extent do security, cost, and convenience criteria interact to determine optimal e-wallet selection within a multi-criteria decision-making framework?
b. How effectively does the hybrid AHP–Profile Matching model evaluate e-wallet alternatives based on multi-criteria decision-making principles?
c. Which e-wallet alternative demonstrates the highest compatibility when evaluated through a proportionally derived ideal-value framework?

Previous studies on e-wallet selection often employ a limited number of evaluation criteria [11][13], which may not fully capture the complexity of user preferences. This study is the first to integrate AHP-derived proportional weighting into Profile Matching ideal-value construction for e-wallet evaluation, ensuring mathematical consistency between criterion importance and suitability assessment.

2. RESEARCH METHOD

2.1 Research Design

This study used a quantitative survey methodology to examine the correlation between research variables by gathering questionnaire data and doing statistical analysis on student data from four state colleges in Medan city in 2024. The research utilizes a hybrid decision-making methodology that integrates the Analytical Hierarchy Process (AHP) and Profile Matching technique to produce objective and quantitative recommendations for selecting e-wallets.

2.2 Data Source and Variables

The population of this study was active students from four state universities in Medan (UINSU, USU, UNIMED, and POLMED) who use e-wallets. Data collection was conducted from March to April 2025. A sample of 100 respondents was determined using the Slovin formula with a 10% margin of error:

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where :
n = Sample Size
N = Population
e = Margin of error (10%)

The calculation of the sample value is as follows:

$$n = \frac{112.099}{1+112.099\left(0.1\right)^2} = 99.911$$

Therefore, the sample size was set at 100 students and purposive sampling was used to ensure representation from each university. The population size was obtained based on student data in Medan City, as found in 2024 by the Central Statistics Agency (BPS), which presents data on the four universities. The distribution of respondent is shown in the following table:

Table 1. Distribution Across Universities

University	Frequency	Persentage
UINSU	34	34%
USU	22	22%
UNIMED	23	23%
POLMED	21	21%

Respondents were 71% female and 29% male. The sampling technique used was non-probability sampling with a purposive sampling approach. Data were collected through an online questionnaire distributed via Google Forms. To ensure data quality, screening questions were included to confirm that respondent actively used e-wallet services. Responses that were incomplete or inconsistent were excluded from the analysis. This study was conducted in accordance with ethical research principles, and respondent participation was voluntary because the questionnaire was distributed through open online channels, and the exact response rate could not be calculated. Students were selected because the younger generation, particularly Gen Z and millennials, are the most active e-wallet users in Indonesia, making this population relevant for understanding e-wallet preferences. Student population data follows official data from Statistics Indonesia (BPS) for the four universities. It should be noted that this study is limited to students at these four universities, future research is recommended to involve a more diverse sample so that the findings can be generalized to other e-wallet user groups.

2.3 Questionnaire Development and Validation

The questionnaire for this study was developed based on nine evaluated criteria. Students were asked to evaluate each criterion individually, compare the criteria, and evaluate each application individually.

A pilot test was conducted involving all respondents. The questionnaire instrument was tested for validity using correlation and reliability statistics using SPSS, and all items were found to be valid (calculated r > tabulated r), which indicates validity, and reliability testing using Cronbach's alpha produces a value above 0.70, which confirms internal consistency.

2.4 Decision Making Model

After pairwise comparisons n the AHP process, the AHP weights were normalized to get the aspect proportions. The whole matrix met the Consistency Ratio (CR < 0.1). In the Profile Matching method, evaluation criteria are grouped into Core Factors and Secondary Factors, where the core factor represents the most important aspect in the decision-making process (Kusrini, 2007). Based on this concept, this study uses a weighting of 60%–40% to reflect the dominance of core factors while maintaining the contribution of supporting factors. A balanced proportion is necessary to maintain the hierarchy of criteria importance, as a 50%–50% distribution would treat all factors equally, while a more extreme ratio such as 70%–30% could potentially overemphasize core factors and diminish the role of secondary factors. Therefore, a ratio of 60%–40% was chosen as a moderate weighting approach that can improve evaluation balance and stability of ranking results. This weighting is also intended to maintain a balance between the primary and supporting assessments in each aspect [14][15].

This study organizes the evaluation framework into three primary aspects: security, convenience and access, and features and cost, which are operationalized through nine evaluation criteria. While other factors such as interface design, brand loyalty, social influence, and psychological aspects were suggested for further research. The stages of model implementation include determining criteria, AHP weighting, consistency testing, weight normalization, determining ideal profiles, GAP calculations, CF–SF weighting, and determining the final ranking, so that the model can be replicated in similar contexts. However, it should be noted that This approach has several limitations, particularly when dealing with more complex datasets or broader populations, which may require model adjustmen.

2.5 Flowchart

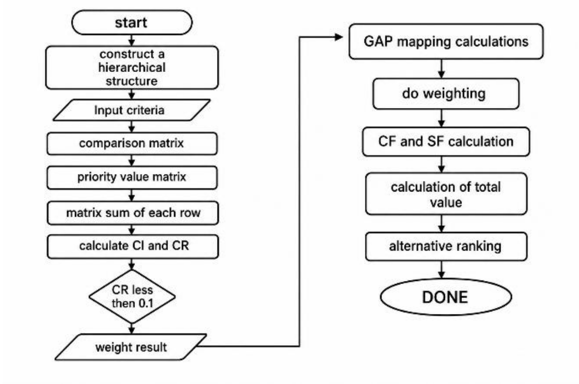

Figure 1. Research Flowchart

Figure 1 illustrates the overall workflow of the proposed hybrid decision-making model. The process begins with data collection through questionnaires, followed by the identification and structuring of evaluation criteria. The AHP method is then applied to determine the relative weights of each criterion, including consistency verification. Subsequently, these weights are proportionally transformed into ideal values for the Profile Matching stage. The next step involves calculating the GAP between actual alternative scores and ideal values, followed by the computation of Core Factor (CF) and Secondary Factor (SF) scores. Finally, the overall ranking of e-wallet alternatives is obtained based on the aggregated evaluation results.

2.6 Analytical Methods or Algorithms

2.6.1 Analytical Hierarchy Process

AHP (Analytical Hierarchy Process) was first introduced by a University of Pittburgh professor, namely Thomas L. Saaty (1980)[16]. The AHP method is used to find the weight of nine criteria based on how respondent rated them through pairwise comparisons. This process involves compiling a decision hierarchy structure, starting with the goal (selecting the best e-wallet), criteria, and alternatives. Each criterion is compared with each other using the Saaty importance assessment scale of 1-9, and then the results are processed into a pairwise comparison matrix. The importance assessment scale (1-9) is presented in the following table[10]:

Table 2. AHP Assessment Importance Scale

Level of Importance	Definition	Information
1	Equally important	Both elements have the same priority.
3	A little more important	Experience and judgment heavily favor one element over its counterpart.
5	More important	One element is very favored, and practically its dominance is very real, compared to its partner element.
7	Very important	One element is proven to be very favored and practically its dominance is very real, compared to its partner element.
9	Absolutely more important	One element is proven to be absolutely preferable to its counterpart, to the highest degree of certainty.
2,4,6,8	Medium value	If there is doubt in the assessment between two adjacent levels of interest, it should be given.

Next, matrix normalization and eigenvector calculations are performed to obtain the weights for each criterion. Consistency testing is also calculated using the Consistency Index (CI) and Consistency Ratio (CR) using the following formula:

$$CI = \frac{\lambda_{maks} - n}{n-1} \quad (2)$$

Where :
CI = Consistency Index
λ_{maks} = Eigen Value Maximum
n = Many Elements

$$CR = \frac{CI}{IR} \quad (3)$$

Where :
CR = Consistency Ratio
IR = Index Random Consistency
The IR value has been determined based on the provisions outlined by Saaty, in the following table [17]:

Table 3. Index Random Consistency

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IR	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.7	1.59

Consistency testing of paired comparison values in the criteria matrix is considered consistent if the CR value is ≤0.1 or less than 10%. If CR is >0.1, then the respondent's answers and the calculations for the paired comparison values are considered inconsistent [18].

2.6.2 Profile Matching

After obtaining the criteria weights from AHP, the next stage is to use the Profile Matching method to calculate the suitability value of each alternative to the ideal criteria[19]. The research questionnaire consisted of close-ended questions using a Likert scale to obtain quantitative data on respondents' evaluations of each criterion. Prior to distribution, the questionnaire was reviewed to ensure clarity of wording, relevance to the research indicators, and to minimize potential respondent misunderstanding. In the completion stage, the first step in this method is the calculation of GAP, namely the difference between the actual value of the e-wallet and the ideal value for each criterion. This GAP value is then weighted according to the GAP difference weighting table[20][21] [22]. The GAP calculation is based on the following formula:

$$GAP = X_i - X_{ideal} \quad (4)$$

Where :
GAP = Difference Between Alternative and Ideal Value
X_i = Alternative Value
X_{ideal} = Ideal Value

Table 4. The Weighted Value of the Difference (GAP)

Difference	Weight Value	Information
0	5	There is no difference
1	4.5	1 level of excess competency
-1	4	1 level of deficiency competency
2	3.5	2 levels of excess competency
-2	3	2 levels of deficiency competency
3	2.5	3 levels of excess competency
-3	2	3 levels of deficiency competency
4	1.5	4 levels of excess competency
-4	1	4 levels of deficiency competency

After that, the criteria are grouped into Core Factors (CF) and Secondary Factors (SF), each of which is calculated as an average value using the following formula [23]:

$$NCF = \frac{\sum NC}{\sum IC} \quad (5)$$

Where :
NCF = Average Core Factor Value
$\sum NC$ = Number of Total Core Factor Values
$\sum IC$ = Number of Total Core Factor Items

$$NCF = \frac{\sum NS}{\sum IS} \quad (6)$$

Where :
NCF = Average Core Factor Value
$\sum NS$ = Number of Total Secondary Factor Values
$\sum IS$ = Number of Total Secondary Factor Items

The total score for each aspect is obtained using a combination formula between CF and SF, with proportional weighting for each aspect. Finally, the total scores from the main aspects are combined to produce a final ranking of alternative e-wallets, and determine the option that best suits user needs [13][24]. The formula is as follows:

$$N = a(\%) \times NCF + b(\%) \times NSF \quad (7)$$

Where :
N = Total Value
$a(\%)$ = Percentage Value of Core Factor
$b(\%)$ = Percentage Value of Secondary Factor

$$Ranking = x(\%) \times Na1 + y(\%) \times Na2 + z(\%) \times Na3 \quad (8)$$

Where :
N = Total Value
$x, y, z(\%)$ = Percentage of Aspect Value 1,2,3
Na = Aspect Value

3. RESULT AND ANALYSIS

3.1 Data Description and Computational Implementation

This study examined data collected from 100 student participants across four state universities in Medan: UINSU, UNIMED, USU, and POLMED. Individuals that actively utilize diverse e-wallet applications, employing a hybrid methodology that combines the Analytical Hierarchy Process (AHP) with Profile Matching techniques. The computational process carried out in this study as a whole uses microsoft excel, both in data processing, matrix calculation, normalization and ranking prosesses.

3.2 Results of AHP Method Analysis

Based on the data, respondents assessed the importance of each criterion through pairwise comparisons. This research was then converted into a matrix and calculated using the Saaty scale for importance ratings of 1-9. From the questionnaire results, a comparison matrix was obtained using the following geometric mean:

Table 5. Matrix of Results of Pairwise Comparison Assessment Recapitulation for All Criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	1	1.099	1.312	1.858	1.624	2.478	1.332	1.114	1.602
C2	0.909	1	1.409	2.077	1.915	2.730	1.679	1.201	1.779
C3	0.762	0.710	1	2.396	2.206	2.201	1.400	0.987	1.639
C4	0.538	0.481	0.417	1	1.132	1.220	0.776	0.652	0.934
C5	0.616	0.522	0.453	0.883	1	1.248	0.831	0.708	0.942
C6	0.403	0.366	0.454	0.819	0.801	1	0.924	0.780	0.775
C7	0.750	0.595	0.714	1.289	1.203	1.082	1	0.802	1.713
C8	0.897	0.832	1.012	1.534	1.411	1.282	1.247	1	1.387
C9	0.624	0.562	0.610	1.070	1.061	1.290	0.594	0.720	1
Total	6.50	6.17	7.38	12.93	12.35	14.53	9.78	7.96	11.77

The next step is to normalize each element in the column so that they add up to 1. This is done by dividing the value of each aspect by the number of columns. Here are the normalized recapitulation results:

Table 6. Normalization of Matrix and Eigenvector of All Criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9	Total	Average (Eigen Vector)
C1	0.154	0.178	0.178	0.144	0.131	0.170	0.136	0.140	0.136	1.368	0.152
C2	0.140	0.162	0.191	0.161	0.155	0.188	0.172	0.151	0.151	1.470	0.163
C3	0.117	0.115	0.135	0.185	0.179	0.151	0.143	0.124	0.139	1.290	0.143
C4	0.083	0.078	0.057	0.077	0.092	0.084	0.079	0.082	0.079	0.711	0.079
C5	0.095	0.085	0.061	0.068	0.081	0.086	0.085	0.089	0.080	0.730	0.081
C6	0.062	0.059	0.062	0.063	0.065	0.069	0.094	0.098	0.066	0.638	0.071
C7	0.115	0.097	0.097	0.100	0.097	0.074	0.102	0.101	0.146	0.929	0.103
C8	0.138	0.135	0.137	0.119	0.114	0.088	0.127	0.126	0.118	1.102	0.122
C9	0.096	0.091	0.083	0.083	0.086	0.089	0.061	0.090	0.085	0.763	0.085
Total	1	1	1	1	1	1	1	1	1	9	1

The following are the most crucial factors to consider when using e-wallets, according to the results of the normalization matrix calculations discussed above:

Table 7. Best Criteria Rating

Criteria	Eigen Vector	Ranking
C2: PIN	0.163	1
C1: Storage security	0.152	2
C3: Transfer security	0.143	3
C8: Transfer rates	0.122	4
C7: Ease of assistance	0.103	5
C9: Discounts or promotions	0.085	6
C5: Integration with other services	0.081	7
C4: Features	0.079	8
C6: Ease of top-up	0.071	9

Based on the ranking table, it can be concluded that PIN is the highest priority in selecting e-wallet applications in Medan, with a weighting of 16.3%. Storage security is second, with a weighting of 15.2%. Transfer security is third, with a weighting of 14.3%. Transfer rates are fourth, with a weighting of 12.2%. The best criteria ranking can also be presented in the following image:

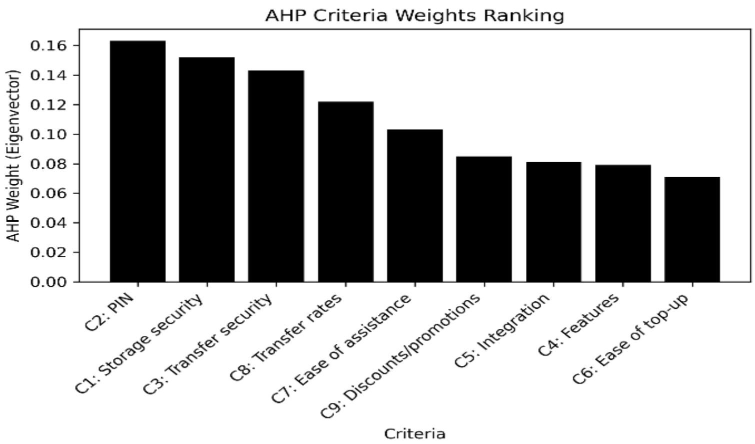

Figure 2. Best Criteria Rating

Next, the value of each column in the initial comparison matrix (table 5) is multiplied by the Eigen Vector value (table 7), which will later be used to obtain the maximum Eigen Value (λ_{max}). The multiplication matrix is as follows:

$$\begin{pmatrix} 1 & 1.099 & 1.321 & 1.858 & 1.624 & 2.478 & 1.332 & 1.114 & 1.602 \\ 0.909 & 1 & 1.409 & 2.077 & 1.915 & 2.730 & 1.679 & 1.201 & 1.779 \\ 0.762 & 0.710 & 1 & 2.396 & 2.206 & 2.201 & 1.400 & 0.987 & 1.639 \\ 0.538 & 0.481 & 0.417 & 1 & 1.132 & 1.220 & 0.776 & 0.652 & 0.934 \\ 0.616 & 0.522 & 0.453 & 0.883 & 1 & 1.248 & 0.831 & 0.708 & 0.942 \\ 0.403 & 0.366 & 0.454 & 0.819 & 0.801 & 1 & 0.924 & 0.780 & 0.775 \\ 0.750 & 0.595 & 0.714 & 1.289 & 1.203 & 1.082 & 1 & 0.802 & 1.713 \\ 0.897 & 0.832 & 1.012 & 1.534 & 1.411 & 1.282 & 1.247 & 1 & 1.387 \\ 0.624 & 0.562 & 0.610 & 1.070 & 1.061 & 1.290 & 0.594 & 0.720 & 1 \end{pmatrix} \times \begin{pmatrix} 0.152 \\ 0.163 \\ 0.143 \\ 0.079 \\ 0.081 \\ 0.071 \\ 0.103 \\ 0.122 \\ 0.085 \end{pmatrix}$$

The overall results of the matrix multiplication above can be presented in the following table:

Table 8. Matrix Multiplication Results and the Sum of Each Row

	C1	C2	C3	C4	C5	C6	C7	C8	C9	Total
C1	0.152	0.180	0.188	0.147	0.132	0.176	0.137	0.136	0.136	1.383
C2	0.138	0.163	0.202	0.164	0.155	0.194	0.173	0.147	0.151	1.488
C3	0.116	0.116	0.143	0.189	0.179	0.156	0.144	0.121	0.139	1.304
C4	0.082	0.079	0.060	0.079	0.092	0.087	0.080	0.080	0.079	0.716
C5	0.094	0.085	0.065	0.070	0.081	0.089	0.086	0.087	0.080	0.735
C6	0.061	0.060	0.065	0.065	0.065	0.071	0.095	0.095	0.066	0.643
C7	0.114	0.097	0.102	0.102	0.098	0.077	0.103	0.098	0.145	0.936
C8	0.136	0.136	0.145	0.121	0.114	0.091	0.129	0.122	0.118	1.113
C9	0.095	0.092	0.087	0.085	0.086	0.092	0.061	0.088	0.085	0.770

After obtaining all the values for each element, each row's value is added together. For the next calculation, the sum is divided by the eigenvector's value to determine the maximum eigenvalue (λ_{max}). The calculation is as follows:

$$\begin{matrix} C1 \\ C2 \\ C3 \\ C4 \\ C5 \\ C6 \\ C7 \\ C8 \\ C9 \end{matrix} \begin{pmatrix} 1.383 \\ 1.488 \\ 1.304 \\ 0.716 \\ 0.735 \\ 0.643 \\ 0.936 \\ 1.113 \\ 0.770 \end{pmatrix} \div \begin{pmatrix} 0.152 \\ 0.163 \\ 0.143 \\ 0.079 \\ 0.081 \\ 0.071 \\ 0.103 \\ 0.122 \\ 0.085 \end{pmatrix} = \begin{pmatrix} 9.103 \\ 9.107 \\ 9.089 \\ 9.072 \\ 9.069 \\ 9.072 \\ 9.074 \\ 9.085 \\ 9.083 \end{pmatrix}$$

The next step is to sum the total results of the division and then divide that sum by the number n to obtain the maximum eigenvalue (λ_{maks}), Afterwards, calculate the Consistency Index (CI) and Consistency Ratio (CR). The analysis is as follows:

3.2.1 Calculation of λ_{maks}

$$\lambda_{maks} = \frac{9.103 + 9.107 + 9.089 + 9.072 + 9.069 + 9.072 + 9.074 + 9.085 + 9.083}{9} = 9.084$$

3.2.2 Calculation of Consistency Index (CI)

$$CI = \frac{\lambda_{maks} - n}{n - 1} = \frac{9.084 - 9}{9 - 1} = 0.011$$

3.2.3 Calculation of Consistency Ratio (CR)

$$CR = \frac{CI}{IR} = \frac{0.011}{1.45} = 0.007$$

Because the CR value shows a value < 0.1, it can be concluded that the respondent answers and the criteria comparison calculations are consistent.

3.3 Results of Profile Matching Method Analysis

3.3.1 Division of aspects and criteria

This study has predetermined criteria divided into three main aspects. Every aspect possesses a Core Factor (CR) and a Secondary Factor (SF). CR and SF are established according to the maximum weight derived from the AHP weighting procedure. Factors ware selected based on the highest weighting within each aspect:

Table 9. Grouping Criteria

Security (46%)	C1: Storage security	0.152	Sf
	C2: PIN	0.163	Cf
	C3: Transfer security	0.143	Sf
Convenience and Access (25%)	C5: Integration with other services	0.079	Sf
	C6: Ease of top-up	0.081	Cf
	C7: Ease of assistance	0.071	Sf
Features and Cost (29%)	C4: Features	0.103	Sf
	C8: Transfer rates	0.122	Cf
	C9: Discount/ promotions	0.085	Sf

3.3.2 Calculation of Standard Profile Value or Ideal Value

To align the AHP weighting results into the 1-5 assessment scale used in the Profile Matching method, the weight of each criterion obtained using the AHP method is converted using the highest weight proportional approach, with the following calculation:

$$X_{ideal} = \frac{W_i}{W_{maks}} \times 5 \tag{9}$$

Where :

X_{ideal} = Ideal Value

W_i = AHP Criteria Weight

W_{maks} = Maximum Weight of AHP Criteria

5 = Highest Scale Limit

Equation 9 applies the maximum normalization technique to transform the weights obtained from the AHP into the 1-5 evaluation range used in Profile Matching. This transformation ensures a comparison between ideal and actual values, which is crucial in a multi-criteria decision-making (MCDM) framework[25].

3.3.3 Competency GAP Calculation and Mapping

Table 10. Alternative Value and Ideal Value

No	Alternative	Security			Convenience and Access			Features and Costs		
		C1	C2	C3	C5	C6	C7	C4	C8	C9
	X_{ideal}	5	5	4	2	2	3	2	4	3
1	DANA	4	4	4	4	4	3	4	4	4
2	OVO	4	4	4	4	4	3	4	4	3
3	Shopee Pay	4	4	4	4	4	4	4	4	4
4	GoPay	3	4	4	4	4	3	4	3	3
5	LinkAja	3	3	3	3	3	3	3	3	3

Table 11. Alternative GAP Values and Criteria

NO	Alternative	Security			Convenience and Access			Features and Costs		
		C1	C2	C3	C5	C6	C7	C4	C8	C9
1	DANA	-1	-1	0	2	2	0	2	0	1
2	OVO	-1	-1	0	2	2	0	2	0	0
3	Shopee Pay	-1	-1	0	2	2	1	2	0	1
4	GoPay	-2	-1	0	2	2	0	2	-1	0
5	LinkAja	-2	-2	-1	1	1	0	1	-1	0

3.3.4 GAP Value Weighting

After obtaining the results of the GAP value calculation, the next step is to give weight to the GAP value (table 10). The following provisions regarding the GAP difference value are based on table 4:

Table 12. Results of the Weighted Value Differences Between Alternatives and Criteria

No	Alternative	Security			Convenience and Access			Features and Costs		
		C1	C2	C3	C5	C6	C7	C4	C8	C9
1	DANA	4	4	5	3.5	3.5	5	3.5	5	4.5
2	OVO	4	4	5	3.5	3.5	5	3.5	5	5
3	Shopee Pay	4	4	5	3.5	3.5	4.5	3.5	5	4.5
4	GoPay	3	4	5	3.5	3.5	5	3.5	4	5
5	LinkAja	3	3	4	4.5	4.5	5	4.5	4	5

3.3.5 Calculation and Grouping of Core Factor (CF) and Secondary Factor (SF)

After obtaining the GAP weight value for each aspect, the next step is to group the criteria into Core Factors and Secondary Factors and calculate the NCF and NSF.

Table 13. Core Factor (CF) and Secondary Factor (SF) Values for Each Aspect

No	Alternative	Security		Convenience and Access		Features and Costs	
		NCF	**NSF**	**NCF**	**NSF**	**NCF**	**NSF**
1	DANA	4	4.5	5	3.5	5	4
2	OVO	4	4.5	5	3.5	5	4.25
3	Shopee Pay	4	4.5	4.5	3.5	5	4
4	GoPay	3	4	5	3.5	4	4.25
5	LinkAja	3	3.5	5	4.5	4	4.75

3.3.5 Calculation of Total Value

After determining the Core Factor and Secondary Factor values, the next step is to calculate the total value of all three aspects simultaneously to determine the most appropriate alternative. The results of the calculation for each aspect are as follows:

Table 14. Total Value of Each Aspect

No	Alternative	Security	Convenience and Access	Features and Costs
		Na (1)	Na (2)	Na (3)
1	DANA	4.2	4.4	4.6
2	OVO	4.2	4.4	4.7
3	Shopee Pay	4.2	4.1	4.6
4	GoPay	4	4.4	4.1
5	LinkAja	3.2	4.8	4.3

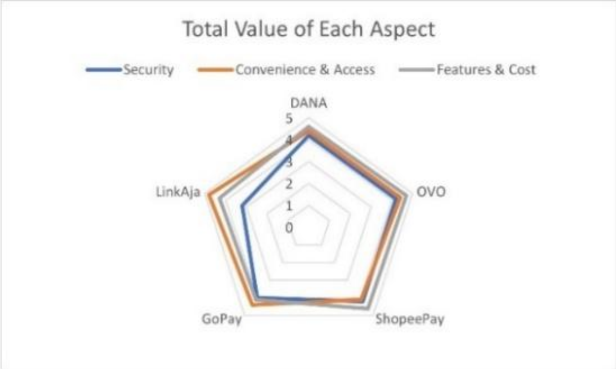

Figure 3. Total Value of Each Aspect

3.3.6 Final Result Calculation (Ranking)

The final result (ranking) is calculated based on the ranking of the best alternatives. The percentages used in this final result are based on the AHP weighting calculations previously described. The percentages for security are 46%, convenience and access 25%, and features and cost 29%. Final scores represent weighted compatibility indices where higher values indicate better alignment with ideal user preferences. The results are shown in the following table:

Table 15. Final Result (ranking)

No	Alternative	Na(1) (46%)	Na(2) (25%)	Na(3) (29%)	Result	Ranking
1	DANA	4.2	4.4	4.6	4.37	2
2	OVO	4.2	4.4	4.7	4.40	1
3	Shopee Pay	4.2	4.1	4.6	4.29	3
4	GoPay	4	4.4	4.1	4.13	4
5	LinkAja	3.2	4.8	4.3	3.92	5

The final rankings show OVO topping the list with a score of 4.40, followed by DANA with a score of 4.37, ShopeePay with a score of 4.29, Gopay with a score of 4.13, and finally, LinkAja has the lowest score among all alternatives namely 3.92.

To test the stability of the ranking results, a sensitivity analysis was conducted by adjusting the weight of the most dominant criterion, with security 36%. This 10% reduction was distributed proportionally across the convenience and access (increasing to 29.6%) and features & cost (increasing to 34.4%) criteria to ensure the total weight remained 100%.

Table 16. Sensitivity Analysis

No	Alternative	Na(1) 36%	Na(2) 29.6%	Na(3) 34.4%	Result
1	DANA	4.2	4.4	4.6	4.40
2	OVO	4.2	4.4	4.7	4.43
3	Shopee Pay	4.2	4.1	4.6	4.31
4	GoPay	4	4.4	4.1	4.13
5	LinkAja	3.2	4.8	4.3	4.05

The scores in the sensitivity analysis calculation show that OVO still has the highest score, namely 4.43, followed by DANA at 4.40, and LinkAja at 4.05 with the lowest score.

3.4 Discussion

The sensitivity analysis indicates that moderate variations in criteria weights do not significantly alter the final ranking of e-wallets, demonstrating the stability and robustness of the hybrid AHP–Profile Matching model. OVO consistently maintains the highest position, suggesting that the recommended alternative reflects balanced performance across multiple criteria rather than dependence on a single dominant factor.

OVO's strong performance can be attributed to its integration with major digital platforms such as Tokopedia and Grab, as well as its extensive loyalty programs and partnerships, which enhance perceived usefulness and user convenience. The relatively small differences in scores further indicate that users evaluate e-wallets based on multiple attributes, reflecting a multi-criteria decision-making behavior. This finding aligns with established technology adoption theories, where perceived usefulness and trust jointly influence user preferences. In particular, the dominance of the security aspect (46%) highlights the importance of risk reduction and trust, as emphasized in the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT).

In comparison with neighboring countries such as Malaysia and Singapore, similar patterns of e-wallet adoption have been observed. Integration with transportation services, e-commerce platforms, and reward systems plays a significant role in shaping user preferences. This suggests that digital ecosystem connectivity is a key determinant in Southeast Asia's e-wallet competition landscape. It is important to note that these findings reflect user preferences during late 2024. Market dynamics, technological innovation, regulatory changes, and promotional strategies may influence future rankings.

From a managerial perspective, the 46% security weighting, fintech developers should prioritize transparent data encryption protocols and multi-factor authentication over incremental promotional features, as marginal gains in cost/convenience yield diminishing returns in student preference models.

Despite these findings, several limitations should be acknowledged. This study has several limitations. First, the use of purposive sampling restricts the generalizability of the findings beyond the selected sample. Second, the response rate could not be determined due to the open online distribution of the questionnaire. Third, the focus on student respondents limits demographic diversity, as the findings may not fully represent broader user groups.

4. CONCLUSION

This study contributes by proposing a hybrid AHP–Profile Matching model with a proportional transformation of AHP weights into ideal values, ensuring consistency between criteria importance and suitability evaluation. The results indicate that security is the most influential factor (46%), with OVO achieving the highest overall ranking among the evaluated e-wallets.

Despite these findings, the study is limited by the use of purposive sampling and a focus on student respondents, which may restrict generalizability. Future research may extend this model by incorporating a more diverse sample and exploring additional criteria or alternative decision-making methods.

From a practical perspective, the proposed proportional weighting mechanism can be adopted by fintech providers and financial regulators as a structured evaluation framework for benchmarking digital payment services. By aligning system development with quantitatively derived user priorities, this approach supports more objective, consistent, and data-driven decision-making in the fintech industry.

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