

Product Feasibility Decision Support System at Kadai Tangkelek with the Weighted Product (WP) Method

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Abstract

Speed and accuracy in work will be the key to the success of a company in providing satisfaction to its customers. The decision support system is also an interactive system that supports decisions in the decision-making process through alternatives obtained from the results of data processing, information and model design. Kadai Tangkelek Padang is a clothing business in West Sumatra that is well known to many tourists as souvenirs from West Sumatra, not only marketing clothes, they also sell other products such as bags and sandals, what happens is that the evaluation of the feasibility of a product is still done manually, so that feasibility calculations tend to be subjective and require a relatively long time. The purpose of this research is to assist companies in calculating product feasibility at Tangkelek Padang shops using the Weighted Product (WP) method. The Weighted Product (WP) method is a decision-making method by means of multiplication to link attribute ratings, where each attribute's rating must be raised to the first power of the attribute's weight. The result of this research is the creation of a system that can assist in the product feasibility decision-making process at the Tangkelek Padang Store, so that the final result of the calculation can determine whether the product is feasible or not suitable for distribution.

Keywords: Decision Support System, Weighted Product (WP) Method, Attributes, Rating, Feasibility . .

JCSITech is licensed under a Creative Commons 4.0 International License. computerized by developing an application that implements the right methods.

1. Introduction

In a company or industry, accuracy and speed of work are important elements in carrying out a job. This can affect the Company in achieving its goals and carrying out its vision and mission. At the same time, knowledge and expertise in the field of technology must also be mastered properly given the increasingly advanced technological developments.

Speed and accuracy in work will be the key to the success of a company in providing satisfaction to its customers. The decision support system is also an interactive system that supports decisions in the decision-making process through alternatives obtained from the results of data processing, information and model design. The model is the main characteristic of a decision support system which is a form of simplified representation or abstraction of a reality.

Kadai Tangkelek Padang is a clothing business in West Sumatra that is well known to many tourists as souvenirs from West Sumatra, not only marketing clothes, they also sell other products such as bags and sandals, what happens is that the evaluation of the feasibility of a product is still done manually, so that feasibility calculations tend to be subjective and require a relatively long time. Therefore, in order to make the process of assessing the feasibility of sending samples more objective and practical, it is best to be

Decision Support System (DSS) is a system that can provide problem solving, communicate for solving certain problems with structured or unstructured. SPK is designed to be used and operated easily by people who only have basic computer operating skills. SPK is made by implementing high competency adaptation so that it can be used as an alternative in making a decision [1].

SPK as a system that supports a person or a small group of managers who work as a problem solving team (decision making team), to make decisions on semi-structured problems by providing a certain amount of specific information. Decision support systems will also facilitate the decision-making process and provide solutions to existing problems [2]. DSS is designed to support all stages of decision-making starting from problem identification, selecting data, determining the approach used in the decision-making process and evaluating alternative selection activities [3].

The Weighted Product (WP) method is a settlement method for solving Multi Attribute Decision Making (MADM) problems. Using the WP method is more efficient because it takes less time, by determining the weight value for each attribute and continuing with the

ranking process which determines the best member according to the criteria [4]

Weighted Product (WP) is a decision-making method by means of multiplication to link attribute ratings, where each attribute's rating must be raised to the first power of the attribute's weight. The results of this study are a decision support system for granting credit, where the implementation of this system shows that the Weighted Product (WP) in the ranking process for granting new customer credit has the same result value, if the method is calculated manually. [5]

Previous studies have discussed a lot about decision support systems using the WP method such as decision support systems for outstanding students [6], evaluating the performance of department store clerks [7], selecting laptops in *e-commerce* [8], determining the best customers [9], selecting student forums [10], selection of scholarship recipients [11][12], selection of unit head positions (kanit)[13], determining the best quality rambutan fruit [14], outstanding students [15], and many other studies in different fields.

The creation of a decision support system using the WP method is expected to assist in conducting data analysis, calculations and assessments to determine product eligibility according to the criteria set by the company in order to reduce the risk of a failed product being received by the customer and speed up the process of determining product feasibility by using a computerized system

2. Research methodology

Research methodology is a science that studies ways to make observations with the right thoughts in an integrated way through scientifically arranged stages to search, compile and analyze and conclude data, so that it can be used to find, develop and test the truth of a knowledge. The research framework carried out in the research will be described in Figure 1:

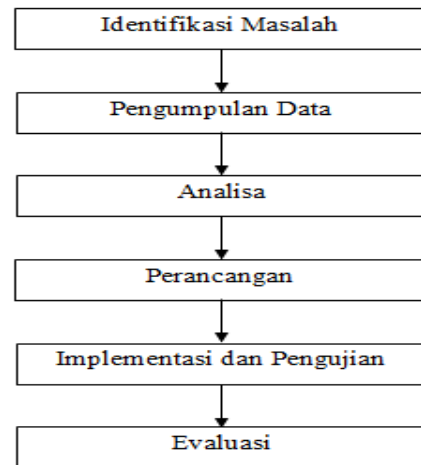


Figure 1. Research Framework

Based on the research stages in Figure 1, each stage can be explained in detail as follows:

2.1 Identification of problems

Problem identification is a process that becomes the beginning of research research to be carried out. Researchers will identify problems in the field and explain what problems have been found in determining scholarship acceptance so far and how these problems are linked later to research procedures. It can be interpreted that the researcher must understand how the obstacles or problems faced by the object and this is the beginning of the research.

2.2 Data collection

As for data collection, the authors obtain data from various sources, such as this research obtained from articles and obtained from other references. This research was also conducted by applying the interview method directly to the product feasibility analysis at Kadai Tangkelek.

2.3 System analysis

The analysis stage is one of the important stages in conducting this research, because it is at this stage that the overall problem identification will be identified in determining how to perform calculations or system management by utilizing the Weighted Product method to find out what products are feasible . through weighted product calculations, so that in the future Kadai Tangkelek Padang can determine appropriate products based on decisions obtained through the system based on the criteria that the author has obtained by asking several questions with the owner at Kadai Tangkelek Padang.

The current use of the old system still uses manual analysis carried out by the Manager in determining product feasibility. This method is considered ineffective, because it requires an application that is

devoted to selecting appropriate products based on the value of the criteria previously inputted, and the end result will be the ranking of all products starting from the highest value to the lowest value obtained through the calculation of the Weighted method. Products (WP).

Based on the description of these needs, an application is designed that applies the Weighted Product (WP) method in the Product Feasibility Decision Support System which will assist Managers in determining appropriate products based on predetermined criteria.

2.4 Design

At this stage , a system design will be created that will be carried out, the researcher uses UML (Unified Modeling Language) as a tool in explaining the flow of program analysis. Only a few UML diagrams are used, namely Use Case Diagrams, Activity Diagrams, Class Diagrams, Sequence Diagrams.

2.5 Implementation

Implementation is the stage of laying the system so that it is ready to operate. Applications to be designed, implemented using the PHP programming language and MySQL database as a decision making tool.

2.6 Testing and Evaluation

System testing is the stage that will be carried out on the resulting system to find out whether the decision support system that has been designed can run correctly and in accordance with the design carried out in determining product feasibility at Kadai Tangkelek Padang. The method used in testing and evaluation is the Black Box method.

3. Results and Discussion

3.1 Weighted Product (WP) Method

weighted product method is one method that works on Multi Attribute Decision Making (MADM). Weighted Product uses a multiplication technique to connect attribute values, where the value of each attribute must be raised to the first power with the related weight attribute. The following are the calculation steps using the Weighted Product method using vectors V and vectors S (Adnan Farizhi & Diana, 2020) :

1. Normalizing the weight of the criteria, using the following equation:

$$W_j = \frac{w_j}{\sum w_j} \dots\dots\dots (1)$$

2. Calculate the vector S, with the following equation:

$$S_i = \prod_{j=1}^n x_{ij} w_j \dots\dots\dots (2)$$

with i = 1, 2, up to the nth

Where $\sum w_j = 1$

W_j is the rank of positive value for the category of profit criteria then the rank of negative value for the category of cost criteria .

3. Accumulating Vector V, or the preference of each alternative, divide the ranking by the following equation:

$$V_i = \frac{\prod_{j=1}^n x_{ij} w_j}{\prod_{j=1}^n (x_j) w_j} \dots\dots\dots (3)$$

with i = 1, 2, ..., m

It's as simple as:

$$V_i = \frac{S_1}{S_1+S_2+S_3} \dots\dots\dots (4)$$

Information:

- S = alternative preference, analogous to vector S.
- V = alternative preferences analogous to vector V.
- X = criterion value.
- W = Criteria Weight
- i = alternative
- j = number of alternatives
- n = the number of criteria
- * = the number of criteria that have been scored on the vector

Weighted Product method is the steps taken to find the best alternative calculation through several various factors, the steps of the Weighted Product method include :

The initial stage in applying the calculation of the Weighted Product method is determining the criteria. In this study the criteria used in the selection process can be seen in Table 1 below :

Table 1 Criteria

No.	Criteria	attributes	Weight
C1	Design	Benefits	5
C2	Material	Benefits	4
C3	Pattern	Benefits	4
C4	Production price	cost	3
C5	Product Model Trends	Benefits	4

The next stage is to make alternatives which are alternatives in this study based on product data that has been taken on the research object. Alternatives can be seen in Table 2 below :

Table 2 Assessment Data (alternative)

No.	Name	product_id
1.	TGKLK	26
2.	Urang Great Crew	27
3.	Urang Kayo Lamo	28
4.	Chinese Marantau	29
5.	Debt Lamo Dikana Juo	30
6.	The Power Of Limo Feet	31
7.	Grand Jackpot	32
8.	Former Bayo	33
9.	Tarompa Japan	34
10.	Where the Earth was Stepped on, Galeh was torn apart	35

The next stage is to rank each alternative against each existing criterion with an assessment of 1 to 5. The level of importance of each alternative can be seen in Table 3 below :

Table 3 Alternative Interests

Interest Level	Information
1	Very Less (SK)
2	Less (K)
3	Enough (C)
4	OK(B)
5	Very Good (SB)

The ranking of each alternative can be seen in Table 4 below :

Table 4 Alternative Ratings

No	Criteria	Data Range	Ket	rank
1.	Design	Simple design	Enough	3
		Attractive design	Good	4
		Contemporary design	Very good	5
2.	Material	Cotton Bamboo 30s	Enough	3
		Cotton Supima	Good	4
		Cotton Galaxy	Very good	5
3.	Pattern	Wrong pattern	Not enough	2
		Pattern fits	Good	4
4.	Producti on price	90,000	Enough	3
		110,000	Good	4
		125,000	Very good	5
5.	Product Model Trends	Old trend	Not enough	2
		Last year's trend	Enough	3
		Recent trends	Good	4

Table 4 shows the range of values that can be given based on the initial data obtained to be used as a criterion in performing calculations using the WP method. Furthermore, in Table 5, the following vector assessment table will be described:

Table 5 Vector Assessment Table

No	Alternative	C ₁	C ₂	C ₃	C ₄	C ₅
1.	TGKLG	4	4	4	3	4
2.	Urang Great Crew	4	5	4	4	4
3.	Urang Kayo Lamo	4	4	4	3	4
4.	Chinese Marantau	3	4	2	3	4
5.	Debt Lamo Dikana Juo	5	4	4	3	3
6.	The Power Of Limo Feet	5	5	4	3	4
7.	Grand Jackpot	5	4	4	3	4
8.	Former Bayo	4	4	4	3	4
9.	Tarompa Japan	4	4	4	3	4
10.	Dima the Earth Stepped	5	4	4	3	4

No	Alternative	C ₁	C ₂	C ₃	C ₄	C ₅
	on					

The next step is to normalize the weights to determine the normalized weights. The divisor weight is obtained using the following formula :

$$W_j = \frac{W_j}{\sum W_j} \dots\dots\dots (1)$$

Calculation of normalized weights can be seen in the following solutions :

$$W = (5, 4, 4, 3, 4)$$

Then the weight correction is done:

$$W1 = \frac{5}{5+4+4+3+4} = \frac{5}{20} = 0.25$$

$$W2 = \frac{4}{5+4+4+3+4} = \frac{4}{20} = 0.2$$

$$W3 = \frac{4}{5+4+4+3+4} = \frac{4}{20} = 0.2$$

$$W4 = \frac{3}{5+4+4+3+4} = \frac{3}{20} = 0.15$$

$$W5 = \frac{4}{5+4+4+3+4} = \frac{4}{20} = 0.2$$

If the W1+W2+W3+W4+W5 values are added up, the result will be = 1

Then, W is multiplied by 1 for the attribute worth the benefit (*benefit*) and W multiplied by -1 for the attribute worth the cost (*cost*).

$$W1 = 0.25 * 1 = 0.25$$

$$W2 = 0.2 * 1 = 0.2$$

$$W3 = 0.2 * 1 = 0.2$$

$$W4 = 0.15 * 1 = 0.15$$

$$W5 = 0.2 * 1 = 0.2$$

After normalizing the weights, the next step is to find the value of S. The value of S is obtained using the following formula :

$$S_i = \prod_{j=1}^n x_{ij} w_j \dots\dots\dots (2)$$

$$S1 = (4^{0.25}) * (4^{0.2}) * (4^{0.2}) * (3^{-0.15}) * (4^{0.2}) = 3,831062003$$

$$S2 = (4^{0.25}) * (5^{0.2}) * (4^{0.2}) * (4^{-0.15}) * (4^{0.2}) = 4.18255821$$

$$S3 = (4^{0.25}) * (4^{0.2}) * (4^{0.2}) * (3^{-0.15}) * (4^{0.2}) = 3,831062003$$

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$$S4 = (3^{0.25}) * (4^{0.2}) * (20^{0.2}) * (3^{-0.15}) * (4^{0.2}) = 3,103691148$$

$$S5 = (5^{0.25}) * (4^{0.2}) * (40^{0.2}) * (3^{-0.15}) * (3^{0.2}) = 3,824361494$$

$$S6 = (5^{0.25}) * (5^{0.2}) * (40^{0.2}) * (5^{-0.15}) * (4^{0.2}) = 4,573050519$$

$$S7 = (5^{0.25}) * (4^{0.2}) * (40^{0.2}) * (3^{-0.15}) * (4^{0.2}) = 4,05085487$$

$$S8 = (4^{0.25}) * (4^{0.2}) * (40^{0.2}) * (3^{-0.15}) * (4^{0.2}) = 3,831062003$$

$$S9 = (4^{0.25}) * (4^{0.2}) * (40^{0.2}) * (5^{-0.15}) * (4^{0.2}) = 4,136152028$$

$$S9 = (5^{0.25}) * (4^{0.2}) * (40^{0.2}) * (3^{-0.15}) * (4^{0.2}) = 4,050854871$$

After getting an S value, then the next step is to accumulate or preference from each alternative to rank the alternatives. The value of V is obtained using the following formula :

$$V_i = \frac{\prod_{j=1}^n x_{ij}w_j}{\prod_{j=1}^n (x_j)w_j} \dots\dots\dots(3)$$

V= S/ Total value of S

$$V1 = 3,831062003 / 39,41470915 = 0,097198789$$

$$V2 = 4,18255821 / 39,41470915 = 0,106116683$$

$$V3 = 3,831062003 / 39,41470915 = 0,097198789$$

$$V4 = 3,103691148 / 39,41470915 = 0,078744489$$

$$V5 = 3,824361494 / 39,41470915 = 0,097028789$$

$$V6 = 4,573050519 / 39,41470915 = 0,116023957$$

$$V7 = 4,050854871 / 39,41470915 = 0,102775206$$

$$V8 = 3,831062003 / 39,41470915 = 0,097198789$$

$$V9 = 4,136152028 / 39,41470915 = 0,104939301$$

$$V10 = 4,050854871 / 39,41470915 = 0,102775206$$

Thus the results of the alternative ranking of product feasibility. As can be seen in Table 6 below :

Table 6 Ranking Table

No	Produ ct_Id	Product Name (Alternative)	V grade	rank	Approp riatene ss Produc t
1.	31	The Power	0.11602395	1	Worthy

		of Legs Limo	7		
2.	27	Urang Great Crew	0.106116683	2	Worthy
3.	34	Tarompa Japan	0.104939301	3	Worthy
4.	32	Grand Jackpot	0.102775206	4	Worthy
5.	35	Where the Earth was Stepped on, Galeh was torn apart	0.102775206	5	Worthy
6.	33	Former Bayo	0.097198789	6	Not feasible
7.	28	Urang Kayo Lamo	0.097198789	7	Not feasible
8.	26	TGKLLK	0.097198789	8	Not feasible
9.	30	Lomo's debt Dikana juo	0.097028789	9	Not feasible
10.	29	Chinese Marantau	0.078744489	10	Not feasible

So the conclusion is that the last 5 product data with the lowest value < 0.1 will be eliminated so that they can be repaired or made a new product. this is done so that product quality is maintained. The selected product is a product that has good eligibility so that no product fails or does not sell well when marketed.

3.2 System Testing

Testing of the system is carried out to determine the extent to which the system that has been designed can overcome problems and also determine the relationship between system components.

1. Page Display an Login

The login page is used as data validation for each user, namely the admin who wants to enter the system by entering an email and password. Figure 2 shows the login form that is on the system.

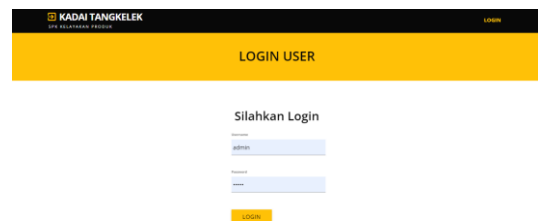


Figure 2. Display of the Login Page

2. Product Data Input Page Display

The product data input page must be filled in to carry out the weighted product method process because the product is also an important requirement in calculating the weighted product

method. In Figure 3 below is the display of the product data input page:

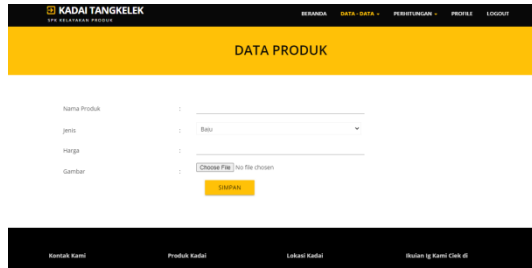


Figure 3. Product Data Input Page Display

3. Criteria Data Page Display

The criteria data input page must be filled in to process the weighted product method because the criteria are also an important requirement in calculating the weighted product method. In Figure 4 below is the display of the product data input page

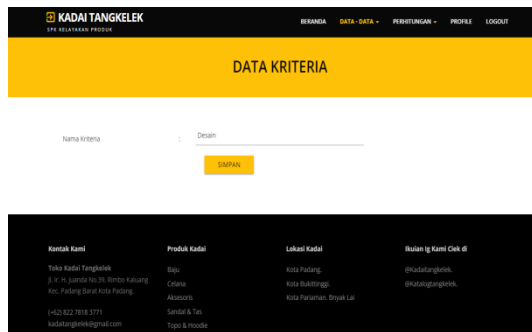


Figure 4. Display of the Criteria Data Page

4. Assessment Data Input Page

Product assessment data input page. In Figure 5 below is the display of the value data input page:

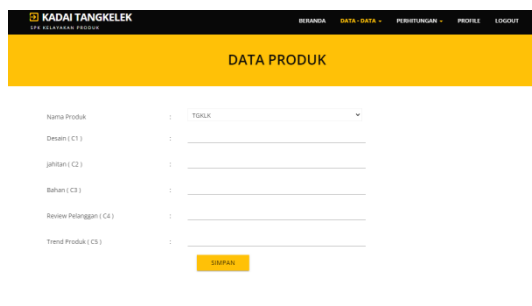


Figure 5. Appearance of Assessment Data Input Page

5. Weight Data Input Page

Weight data input page. In Figure 6 below is the display of the weight data input page:

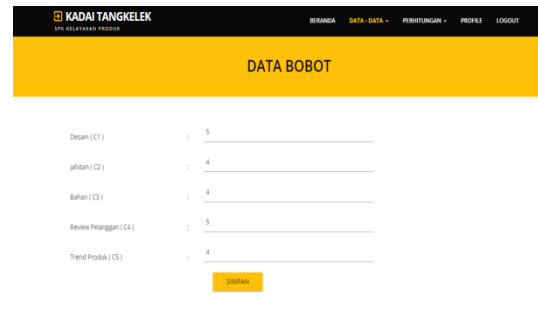


Figure 6. Display of the Weight Data Input Page

6. Vector Rating Page

This display shows the results of calculating product feasibility data that has been inputted in value. In Figure 7 below is the display of the vector assessment view page:

No	ID Produk	Nama	Desain (C1)	jRihan (C2)	bahan (C3)	Review Pelanggan (C4)	Trend Produk (C5)
1	26	TGKUK	4	4	4	5	4
2	27	Urang Anak Hebat	5	4	4	5	5
3	28	Urang Kayo Lamo	5	4	4	5	4
4	29	Marantau Cino	4	5	4	5	4
5	30	Hutang Lamo Dilamo Joo	4	5	4	5	3
6	31	the power of kaki limo	4	4	4	5	5
7	32	Grand jackpot	5	4	4	5	5
8	33	Martan Buayo	3	2	4	2	4
9	34	Tarompa jampang	4	4	4	5	4
10	35	dima bumi di pijak dituju gajah di hoyak	5	4	4	5	5

Figure 7. Display Weight Page

7. Page Product Ranking Results

Product ranking results page that has been tested and determines whether the product is feasible or not. In Figure 8 , the following is a display of the product ranking results page:

No	ID Produk	Nama Produk	Nilai	Rank	Kelayakan Produk
1	27	Urang Anak Hebat	0.10868370263872	1	Layak
2	32	Grand jackpot	0.10868370263872	2	Layak
3	35	dima bumi di pijak dituju gajah di hoyak	0.10868370263872	3	Layak
4	28	Urang Kayo Lamo	0.10436248777451	4	Layak
5	29	Marantau Cino	0.1033930088481	5	Layak
6	31	the power of kaki limo	0.1033930088481	6	Layak
7	34	Tarompa jampang	0.099201761803732	7	Tidak layak
8	26	TGKUK	0.099201761803732	8	Tidak layak
9	30	Hutang Lamo Dilamo Joo	0.098044511871147	9	Tidak layak
10	33	Martan Buayo	0.06651975100491	10	Tidak layak

Figure 8. Display of Product Ranking Pages

4. Conclusion

Based on the results of the research that has been done, it can be concluded that the Product Feasibility Decision Support System at Kadai Tangkelek Padang can help the company in this case the feasibility of the product in conducting data processing, the assessment process and also in making decisions in determining product eligibility, making it easier for companies to carry out independent assessments. precise based on the value of the criteria and preference weights that can make precise calculations in determining the feasibility and ineligibility of the product.

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