

Application of The Weighted Product Model Method for Vendor Selection at PT. Indonesia Comnets Plus

Nur Rofiq^{a,1,*}, Puji Raja Bagus Kausar^{a,2}

^a Informatic Engineering Study Program, Faculty of Computer Science, Pamulang University

¹ dosen00376@unpam.ac.id*; ² pujibagus56@gmail.com

*corresponding author

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ABSTRACT

PT. PLN Icon Plus is a subsidiary of PLN which runs its business in the telecommunications sector as an internet service provider (ISP) requiring collaboration with vendors in various aspects of work. In order to fulfill work functions quickly and precisely and efficiently in the costs incurred, selection is required, so that the results of the work and the costs incurred can reach the target. This problem may require the implementation of a system that can help make decisions in the vendor selection process, namely a decision support system (DSS) with the Weighted Product (WP) method. WP is a popular multi-criteria analysis decision and this method is also based on computational complexity that is not too difficult so the time required to produce calculations is relatively short. The results of this research were obtained from calculating several criteria factors such as legality of PT, Evidence of Technical Qualifications, Unit Specifications, Price and Track Record, resulting in the ranking process within the scope of PT. PLN Icon Plus produces the vector V1 value as the highest value, namely 0.238. This value is an alternative to PT. Sanestri Bangun Jaya (SBJ). The Decision Support System (SPK) which was developed based on a website and has carried out black box testing shows that the system developed has worked well.

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I. Introduction

Every company must collaborate, such as PT Indonesia Comnets Plus, which is currently called PT PLN Icon Plus, for both short and long terms collaboration, the benefit is a symbiotic mutualism where both parties benefit from the collaboration. Cooperation in the process of procuring goods and services is of course generally open to vendors who wish to participate, so that companies can select from several factors such as price, quality and so on, a selection process needs to be held. PT Indonesia Comnets Plus, which is now called PT PLN Icon Plus (sub holding), is a subsidiary of PLN which operates in the field of telecommunications provider services (Internet Service Provider), founded in 2000. In its business process, this company requires vendors as one of the elements of profitable cooperation that can function in various aspects of work. Specifications and expectations in the company's collaboration process with vendors are sometimes not achieved even though the company has incurred costs.

Along with industrial developments and increasingly high market demands, PT Icon Plus must ensure operational performance and services remain optimal. One of the key factors that contributes to this performance is the quality of the vendors selected to provide goods and services. Therefore, selecting the right vendor is crucial to supporting company operations. In the vendor selection process, PT Icon Plus faces several main challenges, including the large selection of vendors offering



similar services making the selection process complex and requiring in-depth evaluation. Another problem is the existence of various selection criteria at PT Icon Plus which must consider various criteria such as price, product quality, service reliability, and vendor reputation. These criteria often have different weights of importance and are subjective decisions, namely an unsystematic selection process can lead to decisions that are subjective and less transparent, thus potentially giving rise to injustice and operational risks [1].

To overcome this problem, this research proposes the application of the Weighted Product Model (WPM) method in the vendor selection process at PT Icon Plus. The WPM method is a multi-criteria decision making technique that can help in selecting the best vendor based on the weight of each predetermined criterion [2][3]. This research will use the following steps in implementing the WPM method, such as identifying and determining the main criteria that are relevant for vendor selection at PT Icon Plus [4]. These criteria can include price, quality, delivery time, after-sales service, and so on. Give weight to each criterion based on its level of importance. This weight can be obtained through a survey of experts or PT Icon Plus management. Calculate the preference value for each vendor using the WPM formula, where each weighted criterion is multiplied by the value given to the vendor. Based on the WPM calculation results, an analysis was carried out to determine the vendor that had the highest value and best suited PT Icon Plus needs.

The application of the Weighted Product Model method is expected to provide a systematic, objective and transparent solution in the vendor selection process at PT Indonesia Connets Plus. In this way, the company can ensure that the selected vendor is truly able to meet the needs and standards set, thereby supporting the company's overall operational and service performance.

II. Method

The methods used in this research are [5]:

1. Method of Collecting Data

The data collection method used for vendor selection at PT. Icon Plus is as follows:

- a. Observation. In this research, observations were carried out directly at PT Icon Plus, by observing all the vendor's work processes and the results of the vendor's work.
- b. Interviews. Interviews are carried out by asking questions and answers to supervisors regarding related issues, to find out vendor problems and the impact of work and the quality of their performance.
- c. Literature review. that is, it involves collecting, reviewing, and analysing literature or written sources that are relevant to the research topic being studied. Literature studies aim to understand existing developments and findings related to research topics, identify gaps in current knowledge, and place new research in a broader context.

2. System Development Methods

The system development method used in the exemplary student selection system is carried out using the waterfall development technique which consists of analysis, design, coding, testing [6].

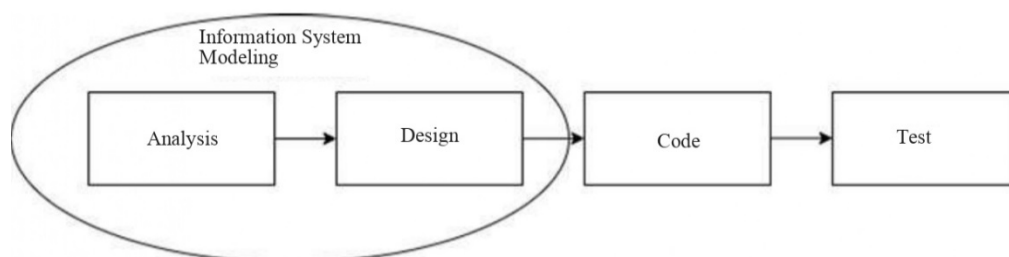


Fig. 1. Stages of the waterfall method

The following is an explanation of the stages above [7]:

- a. Analysis
This stage of system development carries out communication with the aim of understanding the expected software requirements.
 - b. Design
This stage is the system design stage which helps in determining hardware specifications and also helps define the overall system architecture. In this process, the author creates system modelling using the Unified Modelling Language (UML), namely use case diagrams, activity diagrams and sequence diagrams.
 - c. Code
This stage is the stage of implementing the program code using various tools and programming languages according to needs. At this stage the author will code and compile a system based on a previously created design in the PHP programming language and using a MySQL database.
 - d. Test
This stage is the testing stage to find out whether the software is running well or not. So, by having a testing stage, errors, bugs or errors can be prevented in the program.
3. Weighted Product Method
The Weighted Product (WP) method is a multi-criteria decision making technique used to evaluate and select alternatives based on several criteria that have been given weights. WP works by multiplying the value of each criterion which has been normalized and given a weight for each alternative. The value resulting from this multiplication process is then used to determine the preference or ranking of each alternative. One of the advantages of this method is its ability to consider the relative importance of each criterion through assigning weights, so that decisions taken are more comprehensive and in accordance with predetermined priorities. In its application, the WP method begins with identifying relevant criteria and determining the weight for each criterion. After that, data regarding the alternatives to be evaluated is collected and normalized so that they can be compared on an equal basis. The next step is to multiply the normalized criteria values by their respective weights, then multiply all these values to get the final score for each alternative.

III. Result and Discussion

1. Database Design

The following is the database design for vendor selection at PT. Icon Plus:

- a. Entity Relationship Diagram (ERD)
Entity-Relationship Diagram (ERD) is a graphical tool used to model the logical structure of a database [8]. ERD is used to model data and relationships relevant to the vendor selection process. The following is the ERD design for vendor selection at PT. Icon Plus:

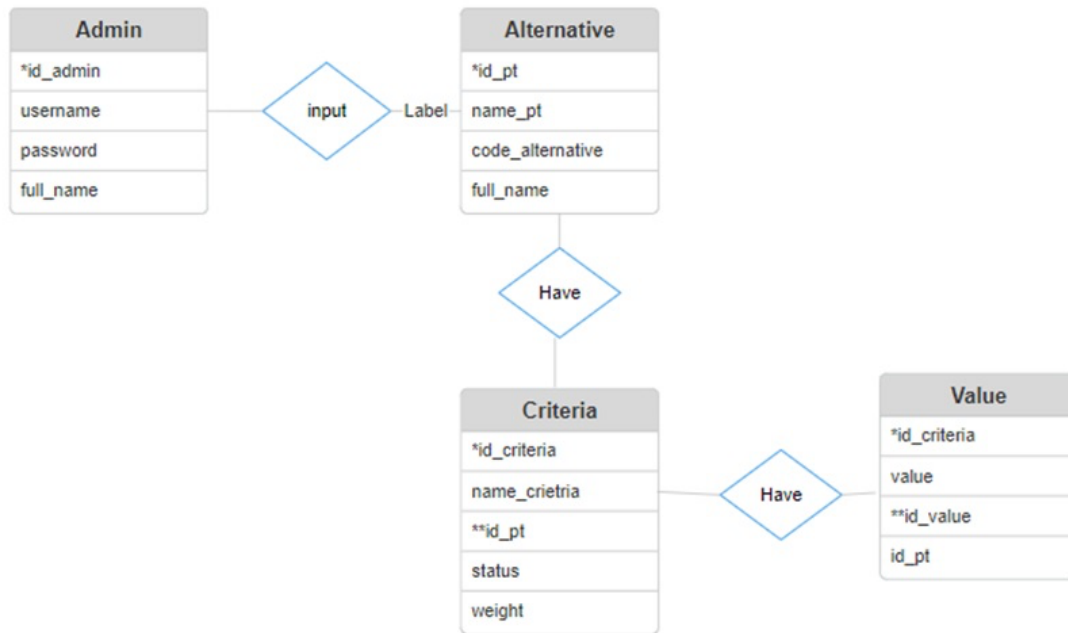


Fig. 2. Entity Relationship Diagram

b. Logical Record Structure (LRS)

Logical Record Structure (LRS) is a way of organizing data in a database system that describes how data is arranged and accessed logically, regardless of how the data is physically stored on storage media [9]. LRS focuses on how data is presented to users and how relationships between data are managed and integrated within the system.

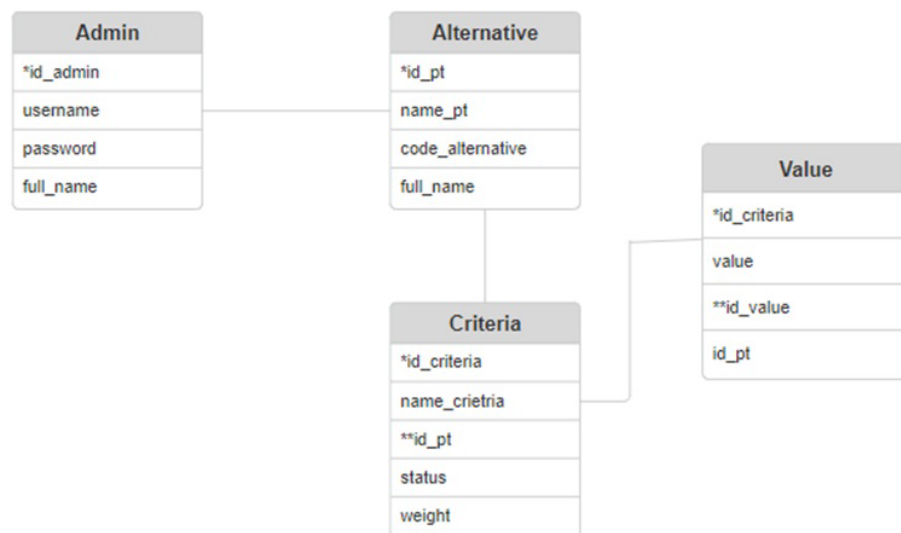


Fig. 3. Logical Record Structure

c. Use case

The use case diagram consists of a user or users which shows the relationship between each user in carrying out activities on the system. There is user or user data, namely the administrator. The following are the use cases that will be defined:

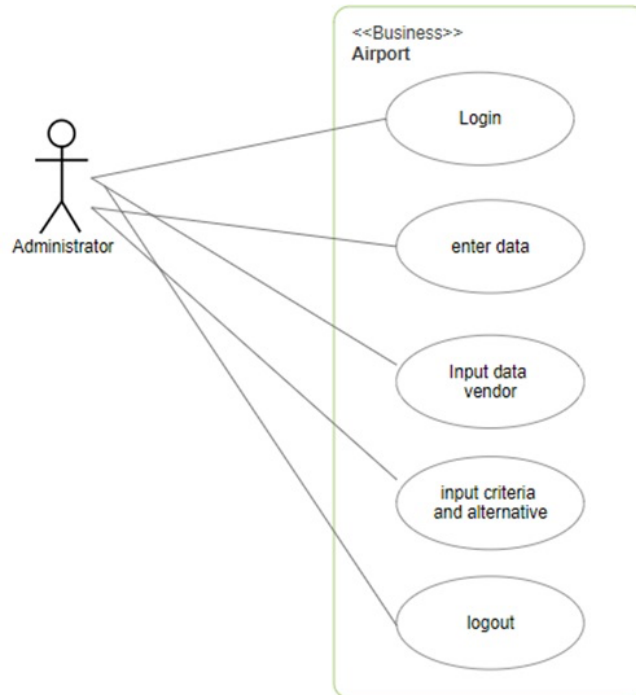


Fig. 4. Use case

2. Calculation of the Weighted Product Method

WP (Weighted Product) is a multi-criteria decision analysis (MCDA) or multi-criteria decision making method [10]. Here the author will discuss the calculation of the weighted product method to determine the selection of the best vendor at PT PLN Icon Plus. The following are the steps for calculating Weighted Product [11]:

1. Determine the criteria used as a reference in decision making. The five criteria used to carry out the assessment are:
 - C1 = Legality of PT
 - C2 = Proof of Technical Qualification
 - C3 = Unit Specification
 - C4 = Price
 - C5 = Track Record

The 5 candidates (alternatives) are as follows:

- A1 = PT Sanestri Bangun Jaya (SBJ)
- A2 = PT Gateway Synergy Prima (GSP)
- A3 = PT Fajar Mitra Krida Abadai (FAMIKA)
- A4 = PT Datakom Strata Three (DS3)
- A5 = PT Multi Control Nusantara (MKN)

2. Giving weight values to each criterion

The level of importance of each criterion is also assessed with a value of 1 to 5, namely:

- 5 = very important
- 4 = important
- 3 = quite important
- 2 = less important
- 1 = not important

Table 1. Table of Criteria and Weights

Criteria	Weight	Cost/Benefit	Code
Legality of PT	3	Benefit	C1
Proof of Technical Qualifications	2	Benefit	C2
Unit Specifications	3	Benefit	C3
Price	5	Cost	C4
Track record	4	Benefit	C5

3. Decision Making to give preference weights for each criterion is $W = (3, 2, 3, 5, 4)$

Table 2. Alternative Value of Each Criterion

Nama Alternative	Criteria				
	C1	C2	C3	C4	C5
PT SBJ	5	2	10	550	99
PT GSP	4	3	6	510	90
PT FAMIKA	2	2	4	440	95
PT DS3	3	1	8	480	95
PT MKN	2	1	6	500	85

4. Perform Weight Normalization

$$W = (3, 2, 3, 5, 4)$$

So weight improvements were made:

$$W1 = 3 / (3+2+3+5+4) = 3/17 = 0,176$$

$$W2 = 2 / (3+2+3+5+4) = 2/17 = 0,117$$

$$W3 = 3 / (3+2+3+5+4) = 3/17 = 0,176$$

$$W4 = 5 / (3+2+3+5+4) = 5/17 = 0,294$$

$$W5 = 4 / (3+2+3+5+4) = 4/17 = 0,235$$

5. Calculate the value of Vector S

$$S1 = (5^{0,176}) (2^{0,177}) (10^{0,176}) (550^{-0,294}) (99^{0,235}) = 1,036$$

$$S2 = (4^{0,176}) (3^{0,177}) (6^{0,176}) (510^{-0,294}) (90^{0,235}) = 0,978$$

$$S3 = (2^{0,176}) (2^{0,177}) (4^{0,176}) (440^{-0,294}) (95^{0,235}) = 0,793$$

$$S4 = (3^{0,176}) (1^{0,177}) (8^{0,176}) (480^{-0,294}) (95^{0,235}) = 0,830$$

$$S5 = (2^{0,176}) (1^{0,177}) (6^{0,176}) (500^{-0,294}) (85^{0,235}) = 0,707$$

6. Calculate the value of Vector V

$$V1 = 1,036 : (1,036)+(0,978)+(0,793)+(0,830)+(0,707) = 0,238$$

$$V2 = 0,978 : (1,036)+(0,978)+(0,793)+(0,830)+(0,707) = 0,225$$

$$V3 = 0,793 : (1,036)+(0,978)+(0,793)+(0,830)+(0,707) = 0,182$$

$$V4 = 0,830 : (1,036)+(0,978)+(0,793)+(0,830)+(0,707) = 0,191$$

$$V5 = 0,707 : (1,036)+(0,978)+(0,793)+(0,830)+(0,707) = 0,162$$

7. Determine the ranking of the resulting Vector V values

By looking at the results above, it is found that the V1 value is greater than the other V values, in the following order:

Table 3. Ranking Results

Rangking	Vector V	Values
1	V1	0,238 (PT. SBJ)
2	V2	0,225 (PT. GSP)
3	V3	0,191 (PT. DS3)
4	V4	0,182 (PT. FAMIKA)
5	V5	0,162 (PT. MKN)

IV. Conclusion

The conclusion obtained are as follows:

1. This system can also function as regular monitoring of vendors working at PT PLN Icon Plus and can be assessed in real time. It is hoped that in fast-paced times like today, companies can choose wisely and the best so that there is no waste of budget costs.
2. The results of this study were obtained from the calculation of several criteria factors such as PT legality, Proof of Technical Qualification, Unit Specifications, Price and Track Record resulting in the ranking process within the scope of PT. PLN Icon Plus resulted in the V1 vector value as the highest value, namely 0.238, obtained by PT. SBJ and PT. SBJ also has the highest Track Record criteria value of 99.

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