Product Pricing Decision Support System with the Simple Additive Weighting Method

Ilmawati [1] ✉, Nadya Alinda Rahmi [2]

[1,2] Putra Indonesia University YPTK Padang

ilmawati2511@gmail.com

Abstract

The development of information systems today has caused quite significant changes in the pattern of decision making within a company. The development of this information system has also made changes from various groups who act as information seekers to always obtain the most appropriate and accurate information that can be used in the process of updating information. Furniture data management at the Kabun Raya Furniture store is still done manually and product pricing is done based on furniture data records. Doing product pricing based on manual management can cause manipulation of product data which makes product pricing irrelevant. To overcome these problems, we need a system that provides convenience in storing and processing product data in the store. The method used in this research is field research, library research, and laboratory research. The tool used for design is UML (Unified Modeling Language). By implementing a decision support system using the PHP Programming Language and MySQL Database, it makes it easy for leaders to determine product prices.

Keywords: Product Pricing, Information Systems, PHP Programming Language and MYSQL Database

1. Introduction

The development of information systems today has caused quite significant changes in the pattern of decision making within a company [1]. The development of this information system has also made changes from various groups who act as information seekers to always obtain the most appropriate and accurate information that can be used in the process of updating information. This is also the case in various fields of information, particularly information in the field of pricing for the company's furniture products. Furniture is an important equipment in supporting human needs, not only to complete home furnishings, but also office buildings, malls, campuses, hospitals and other public places [2]. Many entrepreneurs are currently taking advantage of this opportunity as their business in setting up furniture stores, one of which is the Kabun Raya Furniture store.

Furniture data management at the Kabun Raya Furniture store is still done manually and product pricing is done based on furniture data records. Doing product pricing based on manual management can cause manipulation of product data which makes product pricing irrelevant [3]. To overcome these problems, we need a system that provides convenience in storing and processing product data in the store. The system to be developed can improve the process of managing and determining product prices and avoid data manipulation, because it is done computerized. In order to determine the right price, information on the material data used in the manufacture of the product is needed. Information on product material data is needed to find out how good the quality of the product is [4].

Building a product pricing application is the right medium to implement this information system.

By building a product pricing information system application, it is hoped that it will be able to assist the store in managing data on materials used in the manufacture of products, so that it can determine product prices according to the quality of the products made and as a basis for making pricing decisions.

2. Research Method

The research methodology used can be explained in the form of stages or steps in carrying out activities starting from recording data and collecting several reports needed to be used as guidelines in conducting research. The research framework is a concept or sequence of activities to be carried out. carried out in a study [5]. So that the steps taken by the author in this design do not deviate from the subject matter and are easier to understand. These stages can be explained in Figure 1.

Figure 1. Research Framework

2.1 Preliminary Research
Preliminary research is the first step in conducting research by first analyzing the problem to be developed. The goal after implementing the application that will be developed can help users (users) in utilizing the system.

2.2 Data Collection
The data collection stage is a decisive stage in an application development process. The success or failure of the application depends on the data collected.

2.3 Analysis
In order to conduct research, the authors analyze the data that has been collected and analyze the system that will be run as a solution to the problem formulation obtained.

2.4 Model Design
The design stage aims to design the research according to the objectives so that it does not deviate from the research objectives. The data collection process will be carried out to design the system as a research object. The design will use UML as a design model that will be compiled and arranged based on the design.

a. Use Case Diagrams
Use case diagrams to model and state the unit of function/services provided by the system. This stage is intended to see what activities are carried out by the running system. This use case describes the sequence of activities carried out by actors and systems to achieve certain goals, presenting interactions between actors/actors with the system [6].

b. Class Diagrams
Class diagrams show the existence or existence of classes and relationships in the logical design of a system. Class is a specification which, when instantiated, will produce an object and is the core of object-oriented development and design. Class describes the state (attributes/properties) of a system, as well as offering services to manipulate that state (methods/functions)[7].

2.5 System Implementation
System implementation is the stage of implementing a system that has been designed or designed so that the system that has been created can be operated and used optimally according to needs.

2.6 Testing
After the implementation phase is complete, the authors also carry out tests that aim to test the system that has been designed, correct the system that has been built based on the efficiency level of the system as a solution to solving the problems that have been formulated. This is done by seeing whether the application is running well and in accordance with the design that is being carried out.

3. Result and Discussion

System analysis is carried out with the aim of knowing the weaknesses that occur in the running system or the old system, because by doing the analysis of the current system it will be able to provide convenience in designing and developing the system to be built or a new system, by doing analysis of the old system will later be used as a comparison, correction and development and design towards the new system [8].
In analyzing the system to be analyzed, the analyst must take several steps to understand all the procedures in the system. The steps in the system analysis phase are almost the same as the steps taken in defining system projects to be developed in the system planning stage. The difference lies in the scope of work [9]

a. Application of the SAW (Simple Additive Weighting) Method
In developing this decision support system, information or data was obtained from several sources and the parties concerned, namely the Head of the Kabun Raya Furniture Store. The data will be managed using a method that is useful for the results of the selection process. In the process using this method, the determination of the main factors is needed. Therefore, to determine the quality of a predetermined factor, it is necessary to give weight according to the weight capacity of each.

b. Criteria

Determine the types of criteria in determining product prices. In this study the criteria used for selection were examined, where the criteria were the type of material, model, carving, type of paint, and level of difficulty which determined the price of a product [10]

The criteria for determining product prices are explained in the following table:

1. Determining Criteria Weight and Criteria Normalization Formula

Weight and Normalization Formula for each of the criteria that have been determined as follows:

Table 1. Criteria Weight and Formula

Criteria	Code	Weight	Normalization Formulas
Criteria for Wood Type (Material)	C1	0.40	Benefits
Model Criteria	C2	0.15	Benefits
Size Criteria	C3	0.25	Benefits
Cat Type Criteria	C4	0.05	Benefits
Criteria for the Level of Difficulty of Manufacture	C5	0.15	Benefits

2. Determine Alternatives

The alternatives used in this study can be seen in the following table:

Table 2. Alternatives

Alternative Code	Alternative
L001	wardrobe 1
L002	wardrobe 2
L003	wardrobe 3
L004	wardrobe 4
L005	wardrobe 5

3. Alternative Compatibility Rating Table with Criteria

Table 3. Alternative Compatibility Ratings

Alternative	Criteria				
	Wood type	Model	Size	Paint	Level of difficulty
L001	Meranti wood	Glazed Plain	4 Doors	Colored paint	Currently
L002	Teak wood	Engraved Without Glass	3 Doors	Colored paint	Difficult
L003	Semi Teak Wood	Carved and Glazed	4 Doors	Colored paint	Difficult
L004	Meranti wood	Engraved	2 Doors	Colored paint	Easy
L005	Meranti wood	Engraved Without Glass	2 Doors	Colored paint	Currently

4. Cabinet Normalized Decision Matrix

Make a Decision Matrix x which is formed from the match rating table of each alternative (Ai) on each criterion (Cj) whose elements have been determined using the following formula:

Normalization Formula: $rij = \dfrac{xij}{\max(xij)}$

Normalized Decision Matrix for Alternative L001

$$r11 = \frac{3}{\max(3;5;4;3;3)} = \frac{3}{5} = 0{,}6$$

$$r12 = \frac{2}{\max(2;3;4;3;3)} = \frac{2}{4} = 0{,}5$$

$$r13 = \frac{3}{\max(3;2;3;1;1)} = \frac{3}{3} = 1$$

$$r14 = \frac{4}{\max(4;4;4;4;4)} = \frac{4}{4} = 1$$

$$r15 = \frac{2}{\max(2;3;3;1;2)} = \frac{2}{3} = 0{,}67$$

The results of the normalized performance rating value (rij) form the normalized matrix R as follows:

Table 4. Normalized Cabinets

Alternative	Criteria				
	C1	C2	C3	C4	C5
L001	0.6	0.5	1	1	0.67
L002	1	0.75	0.67	1	1
L003	0.8	1	1	1	1
L004	0.6	0.75	0.33	1	0.33
L005	0.6	0.75	0.33	1	0.33

5. Determining the Final Value of Cabinets

The final result is the defensive value (Vi) obtained from the sum of the multiplication of the normalized matrix row elements (R) with the corresponding defensive weight (W) of the matrix column elements with the formula:

$$Vi = \sum_{j=1}^{n} Wj\ Rij$$

a.   Alternative 1 (L001) defensive calculation

$V1 = (0.4 \times 0.6) + (0.15 \times 0.5) + (0.25x1)$
$+ (0.05x1) + (0.15 \times 0.67)$
$= 0.24 + 0.075 + 0.25 + 0.05$
$+ 0.15 = 0.72$

b. Alternative 2 (L002) defensive calculation

$V2 = (0.4 \times 1) + (0.15 \times 0.75) + (0.25x0.67)$
$+ (0.05x1) + (0.15 \times 1)$
$= 0.4 + 0.1125 + 0.1675 + 0.05$
$+ 0.15 = 0.72$

c. Alternative 3 (L003) defensive calculation

$V3 = (0.4 \times 0.8) + (0.15 \times 1) + (0.25x1)$
$+ (0.05x1) + (0.15 \times 1)$
$= 0.32 + 0.15 + 0.25 + 0.05$
$+ 0.15 = 0.92$

d. Alternative 4 (L004) defensive calculation

$V4 = (0.4 \times 0.6) + (0.15 \times 0.75) + (0.25x0.33)$
$+ (0.05x1) + (0.15 \times 0.33)$
$= 0.24 + 0.1125 + 0.0825 + 0.05$
$+ 0.0495 = 0.54$

e. Alternative 5 (L005) defensive calculation

$V5 = (0.4 \times 0.6) + (0.15 \times 0.75) + (0.25x0.33)$
$+ (0.05x1) + (0.15 \times 0.67)$
$= 0.24 + 0.1125 + 0.0825 + 0.05$
$+ 0.1005 = 0.59$

c. Process
Design which is experience is a system that works, what processes are used, starting from entering input data which is then processed by the system so that it becomes output data.

3.1 System Design
The system design that was carried out consisted of Use Case Diagrams, Sequence Diagrams, Activity Diagrams, Class Diagram designs. The target to be achieved at this stage is the design of the system can compile a detailed, useful, easy, efficient and effective design:

a. Use Case Diagrams
Use case diagrams to model and state the unit of function/services provided by the system. This stage is intended to see what activities are carried out by the running system. This use case describes the sequence of activities carried out by actors and systems to achieve certain goals, presenting interactions between actors/actors with the system [11]
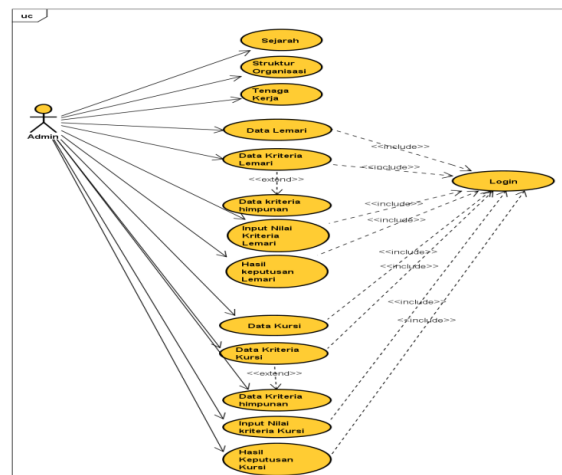

Figure 2. Use Case Diagram

b. Class Diagrams
Class diagrams show the existence or existence of classes and relationships in the logical design of a system. Class is a specification which, when instantiated, will produce an object and is the core of object-oriented development and design. Class describes the state (attributes/properties) of a system, while offering services to manipulate that state (methods/functions) [12]
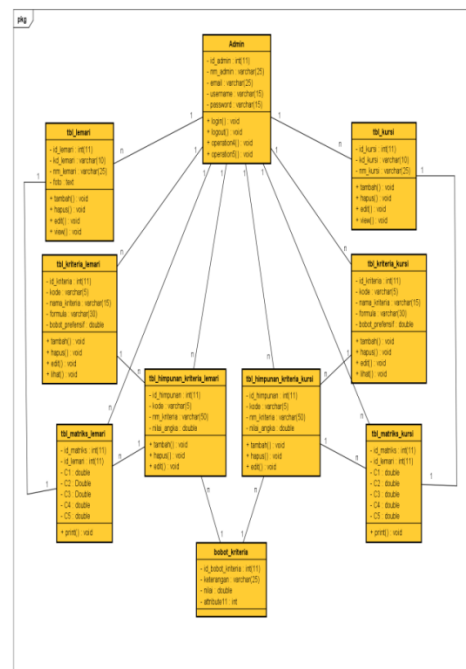

Figure 3. Class Diagrams

c. Sequence Diagrams
Sequence diagrams are used to describe behavior in a scenario in detail over time. This diagram shows a number of examples of objects and the messages that are placed between the objects in the use case. The main component of a sequence diagram consists of objects written in rectangular boxes called participants.

Messages are represented by lines with arrows and time indicated by vertical progress [13].
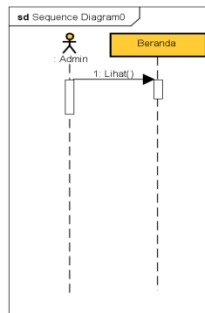

Figure 4. Sequence Diagram

d. Activity Diagrams

Activity diagrams describe the various activity flows in the system being designed, how each flow begins, the decisions that may occur, and how they end. Activity diagrams can also describe parallel processes that may occur in several executions

Activity diagrams are special state diagrams, where most of the states are actions and most of the transitions are triggered by the completion of the previous state (internal processing). Therefore the activity diagram does not describe the internal behavior of a system and the interactions between subsystems exactly, but rather describes the processes and pathways of activity from the top level in general [14]
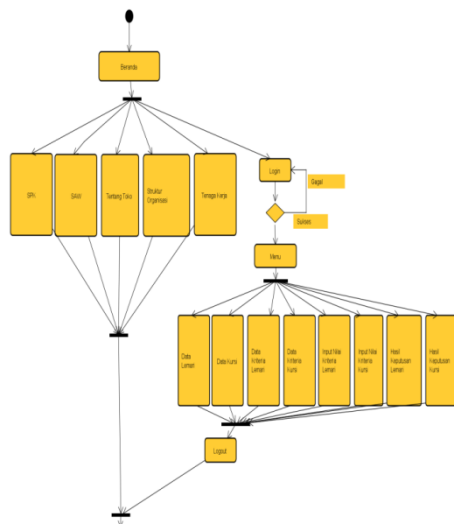

Figure 5. Activity Diagram

3.2 Detailed System Design

The detailed design is a development from the previous global design, in this detailed design we will discuss output, input, design files. So that with a detailed design it will be known directly what is produced from the system, it will be known directly what is produced from the newly developed system.

The design was designed by the author based on needs and interests to get more accurate information. for all interested parties. In this detailed design, a detailed elaboration will be carried out by paying attention to the results to be obtained in detail. The following is the result of designing a catalog system that has been designed

3.3 System Implementation

System implementation is the stage of implementing and testing a new system based on the results of the analysis and design that has been done before. With the implementation of the designed system, the results can be operated and used optimally and as needed. The following is the result of the implementation of the resulting system

a. Main Menu Display

This page is the first page that appears when a user accesses this website. Initial page design in this application
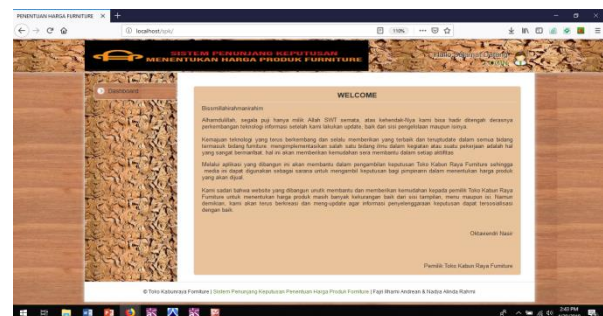

Figure 6. Main Menu Display

b. Data Entry View

cupboard analysis data *entry* page will also display to the *admin* the results of the SAW method SPK calculations as well as the selected alternative after the *admin* clicks submit analysis in the previous *form*
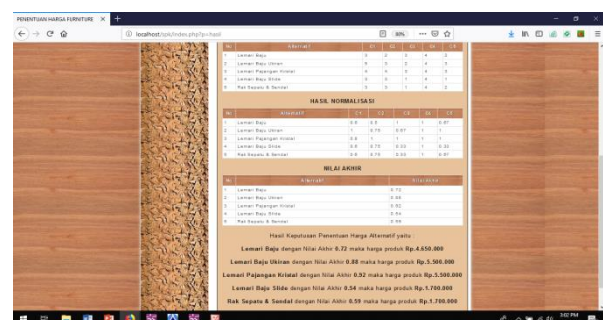

Figure 7. Data Entry Display

4. Conclusion

Based on the description of the previous chapters and the results of the author's research in the field, it can be concluded, With this application, it can help the Kabun Raya Furniture Store in determining the criteria needed in determining product prices. With this application, you can apply the SAW method in supporting product pricing decisions at the Kabun Raya Furniture Store . With the MySQL database, product data and price data at the Kabun Raya Furniture Store will be better maintained and structured, so that the necessary data will be very easy to find when needed.

References

[1] Putri, N., & Manik, E. (2018). Web-Based Information System at the National Narcotics Agency (Bnn) in Binjai City. Kaputama Informatics Journal (JIK), 2(1), 44-52. https://doi.org/10.1234/jik.v2i1.56

[2] Sihite, E., & Surya, GG (2021). DESIGN OF WORK DESK PRODUCTS WHICH CAN STORAGE COMPUTER TO KEEP FREEDOM AT WORK DESK. JCA of Design & Creative, 1(01).

[3] Winata, W., Sharipuddin, S., & Jasmir, J. (2021). DETERMINING THE SELLING PRICE OF SILICA SAND USING THE WEB-BASED SIMPLE LINEAR REGRESSION METHOD. Journal of Informatics and Computer Engineering (JAKAKOM), 1(2).

[4] Jogiyanto HM, 2004. Analysis and Design of Information Systems, Second Edition, Yogyakarta,

[5] Fiorenita, F., & Dwianika, A. (2021). Application of Five Porter Analysis on the Effectiveness of Business Continuity of UKM Actors (Case Study of UD Rey Collection). JSMA (Journal of Science Management and Accounting), 13(1), 37-47.

[6] Fitriyana, F., & Sucipto, A. (2020). Sales Information System by Sales Marketing at PT Erlangga Mahameru. Journal of Technology and Information Systems, 1(1), 105-110. DOI: https://doi.org/10.33365/jtsi.v1i1.239

[7] Putra, DWT, & Andriani, R. (2019). Unified modeling language (uml) in designing an information system for sppd restitution payment requests. Technoif Journal of Informatics Engineering, Padang Institute of Technology, 7(1), 32-39 https://doi.org/10.21063/jtif.2019.V7.1.32-39

[8] Samosir, K., Darmansah, D., & Wardani, NW (2020). Design of a web-based information system for processing student subject schedules at SMPN 31 Padang. JATISI (Journal of Informatics Engineering and Information Systems), 7(3), 451-465. https://doi.org/10.35957/jatisi.v7i3.490

[9] Muzakkir, I. (2017). The application of the Topsis method for a decision support system for determining poor families in Panca Karsa Village ii. ILKOM Scientific Journal, 9(3), 274-281. https://doi.org/10.33096/ilkom.v9i3.156.274-281

[10] Sofia, R., & Febio, J. (2017). Building E-Library Applications Using Html, Php Scripts, And Mysql Databases. Processor Journal, 6(2).

[11] Sutanta, E., & Ashari, A. (2012). Population database distribution to optimize data access: a literature review. Journal of Computer Science, 5(1), 1-9.

[12] Syarif, M., & Nugraha, W. (2020). UML diagram modeling of cash payment systems for e-commerce transactions. JTIK (Journal of Informatics Engineering Kaputama), 4(1), 64-70.

[13] Irmayani, W., & Susyatih, E. (2017). Object Oriented Village Revenue and Expenditure Budget Information System. Equatorial Journal of Informatics, 5(1).

[14] Sari, R., Hamidy, F., & Suaidah, S. (2021). Accounting Information System Calculation of Cost of Goods Manufactured at Convection Sjm Bandar Lampung. Journal of Technology and Information Systems, 2(1), 65-73.