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# Implementation of Extreme Programming and Simple Additive Weighting for Web-Based Sales and Product Preference Analysis in Traditional Herbal Businesses

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**ABSTRACT**

The rapid development of information technology encourages UMKM to adopt digital solutions to improve business effectiveness. This study aims to design a web-based herbal medicine sales information system at UMKM Griya Jamoe Klasik using the Extreme Programming (XP) method and implementing the Simple Additive Weighting (SAW) algorithm to analyze the best-selling herbal medicine products. The research approach used is quantitative descriptive, with data collection methods through observation, interviews, and questionnaires to 10 respondents over a period of one week. The criteria used in the analysis include price, taste, efficacy, and texture, each given a certain weight. The results of the SAW algorithm application show that the "Wedang Kencur" product is the best-selling herbal medicine with a preference value of 0.92, followed by "Wedang Mpon-mpon" at 0.85 and "Kunyit Asam" at 0.79. The system built can automate transaction recording, facilitate sales monitoring, and support accurate and fast data-based decision-making. This research contributes to increasing the competitiveness of UMKM in the digital era. Recommendations for further research are to expand the number of respondents, integrate online payment features, and develop mobile-based applications to reach a wider market.



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## 1. INTRODUCTION

The development of information technology (IT)[1][2] is currently a very important [3], as a form of service to the community in the form of trade or services [4]. Changes in consumer behavior [5][6], especially those driven by easy access to the internet[7], can have an impact on the development of community businesses, both home industries and UMKM. From the results of the 2024 Indonesian internet penetration survey released by APJII, Indonesia's internet penetration rate reached 79.5%. Compared to the previous period, there was an increase of 1.4% [8]. Seeing the number of internet users [9] in 2023, it can be concluded that the impact of internet usage plays a very important role, including in the business world or UMKM, in improving communication with consumers. According to data from the Ministry of Cooperatives and UKM, in 2006 there were 61,651,177 UMKM units in Indonesia [10]. This number continued to increase to reach 64,194,057 units in 2018, which covers around 99% of the total businesses in the country[11]. Here it explains that UMKM [12] what is meant is Griya Jamoe Klasik. Griya Jamoe Klasik is a business that focuses on selling traditional herbal medicine and is aware of the importance of the development of information technology and the digitalization trend that dominates the business world. However, Griya Jamoe Klasik MSMEs have not yet fully utilized the opportunities in the digitalization era, so they have difficulty in marketing their products to various cities and in providing a decision by consumers regarding the type of herbal medicine that is the best-selling herbal

medicine. In addition, the transaction recording process still relies on notebooks, which can cause problems such as difficulty in searching for sales data and the risk of recording errors. They also experience obstacles in monitoring the products sold, so they have difficulty determining the best-selling and most sold products. By designing and developing a web-based herbal medicine sales information system using the Extreme Programming method[13][14] and analyze herbal medicines that are said to be the best sellers by consumers using the SAW algorithm [15][16], so that it is expected to be answered and provide decisions regarding consumers in the interests of the best-selling types of herbal medicine in UMKM Griya Jamoe Klasik and provide increased profits in the UMKM. For decision makers, the ultimate goal is to find the best compromise solution, which is commonly determined using the Simple Additive Weighting (SAW) [17].

## 2. RESEARCH METHOD

In this study, it explains how the development of an information system at UMKM Griya Jamoe Klasik using extreme programming can be designed and how to implement the Simple Additive Weighting (SAW) algorithm [18] so that the type of herbal medicine that is best-selling according to consumers is decided with 10 random respondents in 1 week. With some of the plans above, it is concluded that it is necessary to design and build a web-based system with an extreme programming method that is easy for the owner, as well as decision analysis using the SAW algorithm or method on the types of herbal medicine "Wedang Kencur," "Kunyit Asam," or "Wedang Mpon-mpon" as the best-selling herbal medicine products. Traditional decision-making methods like Simple Additive Weighting (SAW), SAW, known for its simplicity, assigns weights to criteria and calculates a weighted sum for each option, making it applicable for evaluating [19] price, flavor, efficacy, and texture. The Simple Additive Weighting (SAW)[20] method was used to evaluate loca- tions regarding their attractiveness [21]. The most widespread methods used in the field of transport are simple additive weighting (SAW)[22]. Therefore, our choice was to employ the Simple Additive Method (SAW) to calculate the score of each alternative and produce a ranking of all analyzed sites [23]. For the development of the web, the extreme programming method is used. Extreme Programming (XP) is a system development method that tends to use an object-oriented approach [24] or UML. Extreme Programming (XP) methodology is an appropriate approach to take [25], especially in small-scale web development, such as the UMKM Griya Jamoe Klasik.

To facilitate data processing as analyzed in the Griya Jamoe Klasik UMKM, a table has been created on the Criteria and a table of Criteria Assessment Scales, in Table 1 and Table 2 below

Table 1. Data Alternative

| Alternative | Initial |
|---|---|
| Wedang Kencur | A1 |
| Kunyit Asam | A2 |
| Wedang Mpon-mpon | A3 |

Table 2. Scale of Result Criteria

| Result | Scale |
|---|---|
| Strongly Agree | 5 |
| Agree | 4 |
| Neutral | 3 |
| Disagree | 2 |
| Strongly Disagree | 1 |

The SAW method is suitable for ranking the considerations and opportunities as it considers the normalization of the decision matrix, which calculates performance ratings for alternatives based on benefit and cost criteria, with selection criteria varying during the decision-making process [26]. As per the stages of the SAW [27] method in equation (1) to equation (3).

1) Decision Matrix

$$X = \begin{vmatrix} x_{i1} & \dots & x_{ij} & \dots & x_{in} \\ \dots & \dots & \dots & \dots & \dots \\ x_{i1} & \dots & x_{ij} & \dots & x_{in} \end{vmatrix} \quad (1)$$

2) Normalized Decision Matrix

$$r_{ij} = \frac{X_{ij}}{Max\, X_{ij}} \quad (2)$$

$$r_{ij} = \frac{Min\, X_{ij}}{X_{ij}} \quad (3)$$

3) Preference Value and ranking

The using the two optimization-based guidance tools as the basis for a framework for preference rationality analysis in equation (4) [28].

$$V_i = \sum_{j=1}^{n} W_j \, r_{ij} \quad (4)$$

The research that will be conducted above uses the Simple Additive Weighting (SAW) method and the Extreme Programming method. As the flow of this research, in the following figure below

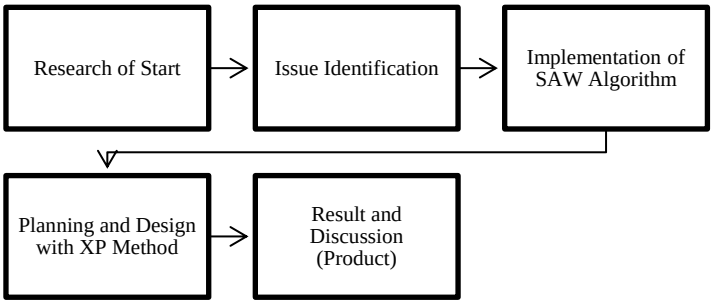


Figure 1. Research Framework

A decision support system (DSS) is a system that can easily solve all problems in a software [29]. In a decision support system (DSS), the higher the value of the profit criteria, the better it is considered to be called benefit, while the lower the value of the cost criteria, the better it is considered to be called cost[30]. Traditional decision-making methods like Simple Additive Weighting (SAW), have long been applied to multi-criteria decision-making tasks across various sectors [19]. The weighted property index method, which the latter functions similarly to the simple additive weighting (SAW) MCDM method [31]. This method is a powerful decision-making tool that combines the concepts of SAW (simple additive weighting) [32], and Extreme Programming (EP). The above is a method of solving the analysis of the data obtained. This study uses a quantitative description approach, so the data is obtained using observation, interview, and questionnaire methods. Critical, most practical models and transitional programs for organizing transition care have been developed and evaluated through quantitative analysis or focusing on the effectiveness [33]. Content analysis to examine open-ended questions collected from qualitative interviews and quantitative data to provide a descriptive statistical analysis [34].

## 3. RESULTS AND ANALYSIS

Research with a quantitative-descriptive approach produces a web-based design of the Griya Jamoe Klasik UMKM system with predictions of best-selling herbal medicine sales using the SAW Algorithm with stages as in Figure 1 above. a) Stage 1 is the identification of research problems, namely in the form of observation analysis, interviews, and questionnaires; b) Stage 2 is implementing the Simple Additive Weighting (SAW) algorithm; c) Stage 3 is designing and building an information system using the Extreme Programming method with the UML model; d) The final stage is the result in the form of a product.

### 3.1. Problem Identification Stages

In identifying this problem, data was obtained from observations[35] in the form of UMKM Griya Jamoe Klasik, which is said to be still far from computer system processing, only in communication using computer interaction in the form of WhatsApp chat (incidental). As for the analysis, interviews and questionnaires were used. The data obtained, as in Table 1 Alternative and Table 2 Assessment Scale (above), in addition to data on the criteria for making the best-selling choice decision on the herbal medicine, are price, taste, efficacy, and texture, which can be seen in the table below

Table 3. Criteria and Weight

| Criterion | Initial | Weight |
|---|---|---|
| Prices | C1 | 30% |
| Flavor | C2 | 20% |
| Efficacy | C3 | 30% |
| Texture | C4 | 20% |

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Table 4. Alternative and Criteria

| Alternative | Criterion | | | |
|---|---|---|---|---|
| | C1 | C2 | C3 | C4 |
| A1 | 15000 | 4 | 5 | 3 |
| A2 | 18000 | 4 | 3 | 4 |
| A3 | 17000 | 3 | 4 | 5 |

Researchers choose the 4 criteria above, namely price, because sales are closely related to price; likewise, taste—people will be attracted to taste and efficacy and soft texture. For efficacy is given the same high weight because it has a high influence compared to taste and texture.

### 3.2. SAW Algorithm Implementation Stages

In the SAW method or algorithm, what will be determined is the normalization matrix, as shown in the results below.

Table 5. Weighted Normalization Matrix (R)

| | | | |
|---|---|---|---|
| 1 | 1 | 1 | 0,60 |
| 0,83 | 1 | 0,60 | 0,80 |
| 0,88 | 0,75 | 0,80 | 1 |

The explanation is
$R_{C1}$ = 15000 : 15000 = 1
$R_{C1}$ = 15000 : 18000 = 0.83
$R_{C1}$ = 15000 : 17000 = 0.88
$R_{C2}$ = 4 : 4 = 1
$R_{C2}$ = 4 : 4 = 1
$R_{C2}$ = 3 : 4 = 0.75
$R_{C3}$ = 5 : 5 = 1
$R_{C3}$ = 3 : 5 = 0.60
$R_{C3}$ = 4 : 5 = 0.80
$R_{C4}$ = 3 : 5 = 0.60
$R_{C4}$ = 4 : 5 = 0.80
$R_{C4}$ = 5 : 5 = 1
The next step is to find the preference value and its ranking, namely by looking at the following preference

Table 6. Preference Values from Weighted Normalization

| Alternative | C1 | C2 | C3 | C4 |
|---|---|---|---|---|
| A1 | 0.30 | 0.20 | 0.30 | 0.12 |
| A2 | 0.25 | 0.20 | 0.18 | 0.16 |
| A3 | 0.26 | 0.15 | 0.24 | 0.20 |

The explanation is
$V_1$ = 0.30 + 0.20 + 0.30 + 0.12 = 0.92
$V_2$ = 0.25 + 0.20 + 0.18 + 0.16 = 0.79
$V_2$ = 0.26 + 0.15 + 0.24 + 0.20 = 0.85
so that the numbers and decisions are obtained in the form of rankings

Table 7. Result

| Alternative | Result | Ranking |
|---|---|---|
| **A1** | **0,92** | **1** |
| A2 | 0,79 | 3 |
| A3 | 0,85 | 2 |

So, the best-selling and most popular herbal medicine for customers during the 1 week above is Wedang Kencur herbal medicine, with a preference value (V) of 0.92. The decision above is used to fulfill the raw materials in mixing Wedang Kencur herbal medicine because consumer interest can have an impact on buyer interest.

### 3.2. Design System Stages

At the system design stage, a web-based sales information system will be designed using the extreme programming (XP) method, with the previous stage being needs analysis through the observation [36] field. XP is a methodological approach to building systems by increasing efficiency and flexibility[37], in this case in the form of a flowchart design, as shown in Figure 2.

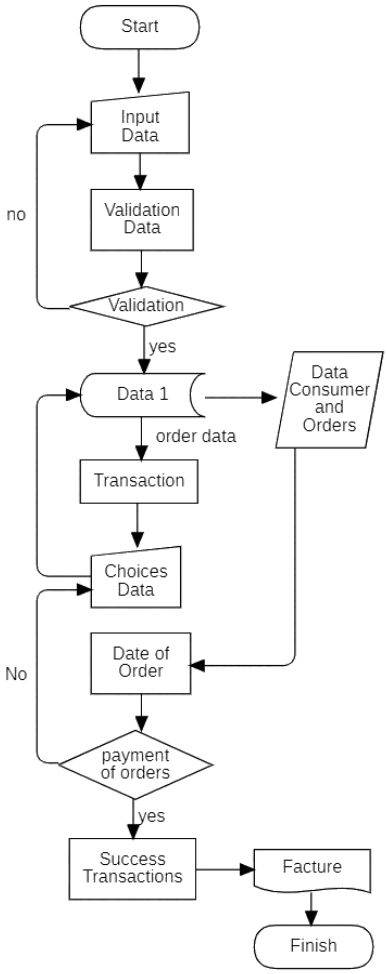


Figure 2. UMKM Sales Process

### 3.3. Product Stages

Looking at Figure 2 Flowchart, in Figure 3 see a Website that was created using the Extreme Programming method, namely

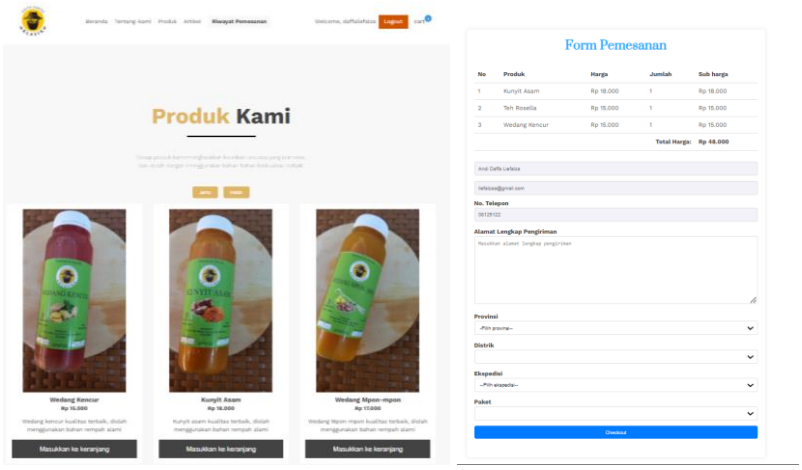


Figure 3. Products and Orders

## 4. CONCLUSION

This study successfully developed a web-based herbal medicine sales information system at Griya Jamoe Klasik UMKM by implementing the Extreme Programming (XP) method and the Simple Additive Weighting (SAW) algorithm. This system is designed to answer the needs of more effective transaction recording, more accurate product monitoring, and support data-based decision-making. Through a quantitative descriptive approach and data collection using observation, interviews, and questionnaires to 10 respondents, it was found that "Wedang Kencur" was the best-selling herbal medicine product with a preference value of 0.92. Other products, "Wedang Mpon-mpon" and "Kunyit Asam," each obtained preference values of 0.85 and 0.79. These results clarify consumer tendencies in choosing products based on price, taste, efficacy, and texture. The application of the SAW algorithm in this system allows for objective, fast, and measurable analysis of consumer choices. In addition, the use of the Extreme Programming method accelerates the system development process, increases flexibility to changing user needs, and ensures that the quality of the resulting software is maintained. This web-based system provides real contributions in supporting the digitalization of small businesses, increasing operational efficiency, and assisting UMKM in designing data-based marketing and production strategies. With this system, UMKM Griya Jamoe Klasik can be more adaptive to market changes and is able to expand its business reach. In the future, this research can be further developed by increasing the number of respondents, integrating online payment systems, and designing a mobile application version to increase consumer accessibility and expand the market digitally.

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