Website for a Decision Support System for Selecting a Healthy Diet Menu Using the Weighted Product (WP) Method

Lusiana Parhusip, Abdul Khaliq, Leni Marlina

Abstract

Choosing a healthy diet menu is a process that requires consideration various aspect nutrients such as calories, protein, fat, carbohydrates, and fiber. The amount the criteria that must be analyzed often make users difficulty in determining foods that suit nutritional needs and dietary goals. Therefore, this study aims to build a support system decision website -based that can help the process of selecting a healthy diet menu using the Weighted Product (WP) method. WP method is used because it is able to process Lots criteria simultaneously by giving weight to each criteria according to level its importance. The research process was carried out using the Waterfall development model, including requirements analysis, system design, implementation, and testing. The system is built using web technology and is equipped with features data management criteria, weights, values preferences, food alternatives, and calculation automatically based on WP method. Test results using the Black Box method show that all over system functions are running well without any errors being found error. The system is capable of producing food recommendations based on calculations vector S and vector V, then produce an alternative ranking best. Thus, the support system this decision can help users get Healthy diet menu recommendations that are faster, more objective, and according to nutritional needs each.

Keywords : Decision Support System, Healthy Diet, Website, Weighted Product, Nutrition, Ranking.

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Introduction

Health is very important aspect in human life influenced by daily eating patterns. In today's modern era, awareness society regarding the importance of guard Healthy eating patterns are increasing. However, there are still Lots individuals who experience difficulty in determining a diet menu that suits his body's needs. This is caused by a lack of knowledge of composition nutrition, number of calories, and suitability between types of food with conditions a person's physical and dietary goals, such as losing weight, maintaining fitness, or control level blood sugar.

Problems it becomes more complex when someone faced with various alternative menu with content different nutrients. Without a structured guide or system, the process of taking Decisions about choosing the right diet menu are often made subjectively, based on taste or inaccurate information. In fact, mistakes in determining the diet menu can have a negative impact on health, such as nutritional deficiencies. nutrition, fatigue, or even disorders metabolism.

To overcome problem mentioned, it is needed A Decision Support System (DSS) that can help users determine a healthy diet menu objectively and based on data. The DSS plays a role in providing recommendations. best taking into account various relevant criteria, such as levels calories, protein, fat, carbohydrates, and value other nutrients. One method frequently used in SPK is the Weighted Product (WP) method, because it is able to provide proportional calculation results for each alternatives based on weight interest each criteria.

previous studies have proven that effectiveness application of the WP method in decision making decision multicriteria. For example, research by Putri and Nugroho (2022) entitled " Decision Support System for Selecting Healthy Foods Using the Weighted Product Method" shows that the WP method is able to provide accurate menu recommendation results based on the value nutrition and calorie needs daily users. The results of the study show that level system accuracy in providing recommendations reached 90% compared to the recommendation expert Nutrition. Another study by Siregar et al. (2022) on " Selection of Diet Menus for Diabetes Patients Using the Weighted Product Method" also concluded that the WP method can help diabetes sufferers choose foods with high calorie content. sugar that is safe and meets energy needs daily.

This research, it can be concluded that the application of the Weighted Product method has been proven effective in the decision-making process decision based multicriteria, especially in the context of healthy food selection. However, most previous studies still limited to desktop- based applications or not yet utilizing web -based platforms that are more easily accessible to the public wide. Therefore, the development of a Website for a Decision Support System for Selecting a Healthy Diet Menu Using the Weighted Product (WP) Method is... step important innovation. Through a website -based platform, users can easily access the system anytime and anywhere, and get menu recommendations that suit your conditions body and individual diet goals. With this system, it is hoped that public can assisted in making better decisions rational, efficient, and data- based in determining healthy eating patterns. In addition, this research is expected to can contribute to the development of information technology in the field of health and nutrition, as well as support a healthy lifestyle for people in today's fastpaced digital era.

Literature Review 2.1. Decision Support System (DSS)

Support System (DSS) is a computer- based information system used to assist decision makers. decision in solving semi - structured problems both structured and unstructured. According to Turban (2018), DSS combines data, models, and interfaces. users to support the retrieval process decisions in more detail right. In context Selecting a healthy diet menu, SPK

functions to help users determine foods that meet the criteria health certain things such as calories, fat, protein, vitamins, and preferences personal. SPK is very useful in the fields of health and nutrition because it is able to process Lots criteria simultaneously and reduce subjectivity. With SPK, the selection of diet menus becomes more targeted, according to nutritional needs, and helps the process of weight loss or fulfilling special diets.

2.2. Website as a Decision Support System Platform

Website is a platform that many used in the development of SPK applications because easily accessible, does not require installation, and can used on various devices. According to Nugroho (2020), web -based applications allow interaction more users dynamic as well as make things easier real-time data presentation. In context selection of a healthy diet menu, use of the website allows users enter preferences or conditions health (for example, the number of calories daily required) then the system can display automatic food recommendations. The website also allows food database integration, visualization mark nutrition, and data updates at any time without disturbing the user.

2.3. Choosing a Healthy Diet Menu

A healthy diet is a diet that pays attention to balance nutrients such as carbohydrates, protein, healthy fats, fiber, vitamins, and minerals. According to WHO (2021), choosing the right food plays an important role in prevention obesity, diabetes, and other degenerative diseases.

Diet menu recommendation systems usually take several aspects into account :

1 The number of calories needed per day,
2 Contents nutrition from each food,
3 Food preferences (low salt, low fat, high protein, etc.), 4 goals (lose weight, maintain weight) health, or medical diet).

Because of the large number of criteria that must be considered, the Multi-Criteria Decision Making (MCDM) method is very suitable for use, one of which is the Weighted Product method.

2.4. Weighted Product (WP) Method

Weighted Product (WP) is a method in Multi-Criteria Decision Making (MCDM) which is used to rank alternatives based on the results of multiplication. from every criteria raised to the power of their weights. According to Kusumadewi & Purnomo (2017), WP uses the concept of multiplicative weighting, namely each criteria multiplied so that produce mark vector preferences for each alternative.

Characteristics of WP Method

1 Using multiplication between criteria, not addition.
2 Every criteria have a weight that indicates level his interests.
3 Very efficient when used on large-scale data ratio and value positive.
4 Provides stable and accurate ranking results.

Research Methodology 3.1 Types of Research

Study This is study Research and Development (R&D) which aims For develop A system website supporters decision (SPK) for choosing a healthy diet menu use Weighted Product (WP) method. The approach used is quantitative, because the calculation process diet recommendations are made in a way mathematical based on weight and value criteria.

3.2 System Development Methods

Study This using development models device soft Waterfall, which consists of from a number of stages following :

1. Analysis Need
    a. Do identification need users like need calculation nutrition, limitations calories, and dietary preferences.
    b. Collecting nutritional data food (calories, protein, fat, carbohydrates, fiber, vitamins).
    c. Determine criteria and weights For WP method.
2. Design System
    a. Designing website architecture using client–server approach.
    b. Make database design (table food, table criteria, table weights, and tables results calculation).
    c. Designing interface user interface (UI/UX) for data input and display recommendation.
3. Implementation
    a. Building a website using Language programming such as
    PHP/HTML/CSS/JavaScript or appropriate framework need.
    b. Implementing WP method to in logic SPK calculation.
    c. Integrating database with web application.
4. Testing
    a. Use method Black Box Testing For ensure all over function walk in accordance need.
    b. Performing accuracy testing recommendation with compare results system with standard need nutrition or recommendation expert.
5. Maintenance
    a. Bug fixes if found problem after system used.
    b. Food database addition or adjustment weight If required.

3.3 Data Sources

Study This use two type data source :

1. Primary Data
    a. Interview with expert nutrition or users who are on a diet.
    b. Observation need users related to healthy diet menus.
2. Secondary Data
    a. Nutritional data food obtained from table nutrition, journal health and literature from the Ministry of Health or WHO.
    b. Related research papers Weighted Product and SPK methods.

3.4 Data Collection Techniques

Data collection techniques used includes :

1. Observation
   Observing problems experienced users in choose a healthy diet menu, such as difficulty count need calories and nutrients.
2. Interview
   Conducted with expert nutrition or individuals who follow a certain diet For know factor What only that affects election food.
3. Studies Library
   Collecting theory related to SPK, WP method, website, and nutrition food from books, journals, and research previous.
4. Documentation

Collecting table data nutrition food, diet menu list, and requirement data calories based on age, weight, and activity.

Results

The results of the research that has been carried out starting from the system implementation process to testing functional and analysis of calculation results using the Weighted Product (WP) method. The results of this study include website development support system decision making (SPK) for selecting a healthy diet menu, integration of the WP method in the system, and evaluation of system performance in providing food recommendations based on criteria nutrition. This chapter also shows appearance user interface, database structure, flow WP calculations, as well as The system output is a ranking of alternative food menus. In addition, a discussion is held regarding the suitability of the recommendations to nutritional needs. users and applicable nutritional standards. System testing is carried out using Black Box Testing techniques to ensure that all over feature can functions as designed. Thus, this chapter becomes foundation for understanding effectiveness and performance of the system that has been built, both from aspect technical and in terms of accuracy recommendations for healthy diet menus are produced.

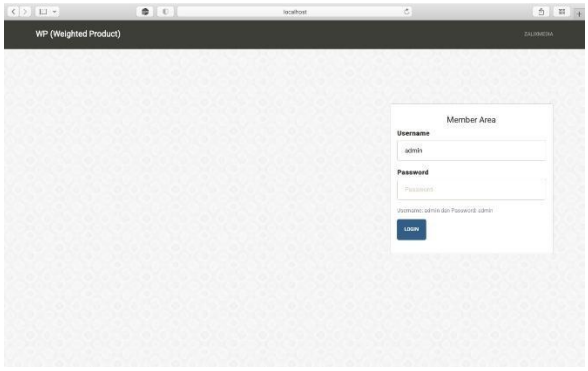


Figure 1. Login menu

The login menu is used for admins to enter the system, username and password are available.

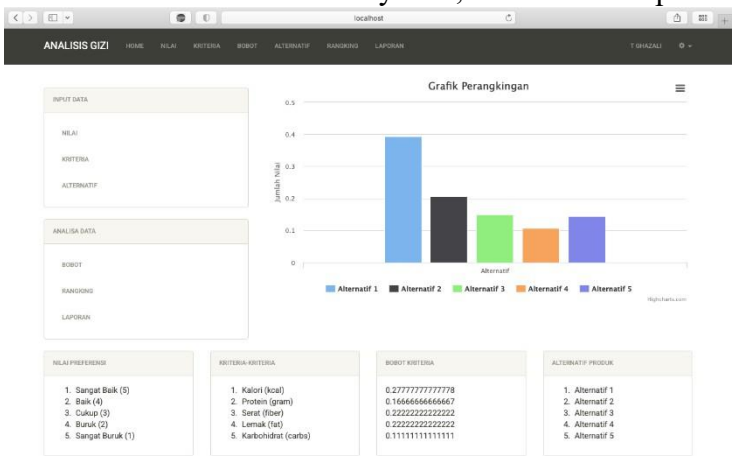


Figure 2. Analysis Dashboard Nutrition

Analysis Dashboard Nutrition This designed For support the process of selecting a healthy diet menu use Weighted Product (WP) Method. Dashboard displays a number of element important that represents channel taking decision, start from mark preferences, criteria used, weights criteria, up to results ranking alternative menu.

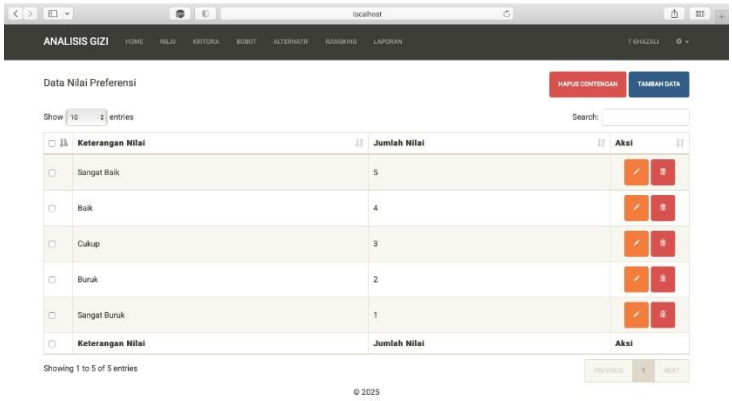


Figure 3. Preference Value Data Page

Preference Value Data Page is part of the Analysis system Nutrition that functions to manage value data qualitative used as a basis calculation on the retrieval method decisions. These values are used as a reference weighting in the analysis process, so that data management must be consistent and easy to do.

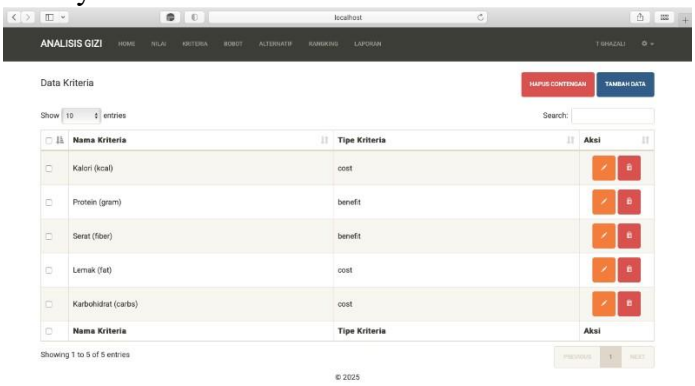


Figure 4. Criteria Data Page

Criteria Data Page is one of the feature main in the Analysis system Nutrition is used to manage the list of criteria that become base calculations in the retrieval process decision. These criteria represent aspect assessed nutrients, such as calories, protein, fiber, fat, and carbohydrates. Each criteria categorized as costs or benefits according to their impact on the assessment.

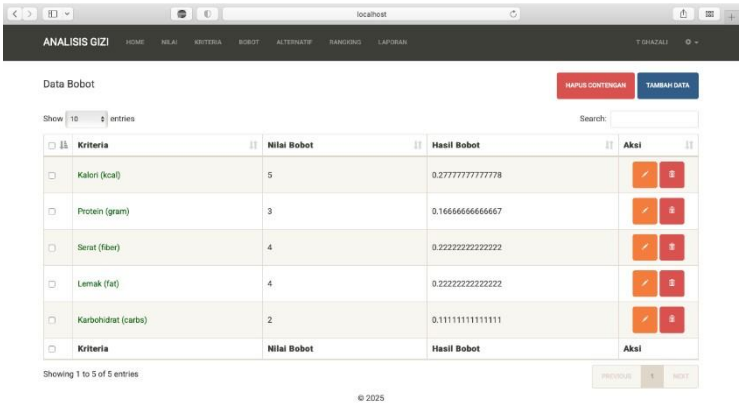


Figure 5. Page Weight Data

Page Weight Data is features used For manage mark weight from every criteria involved in the analysis process nutrition. Weight This determine level interest each criteria in calculation use method taking decision. With existence page this, user can view, change, and add weight in accordance need analysis.

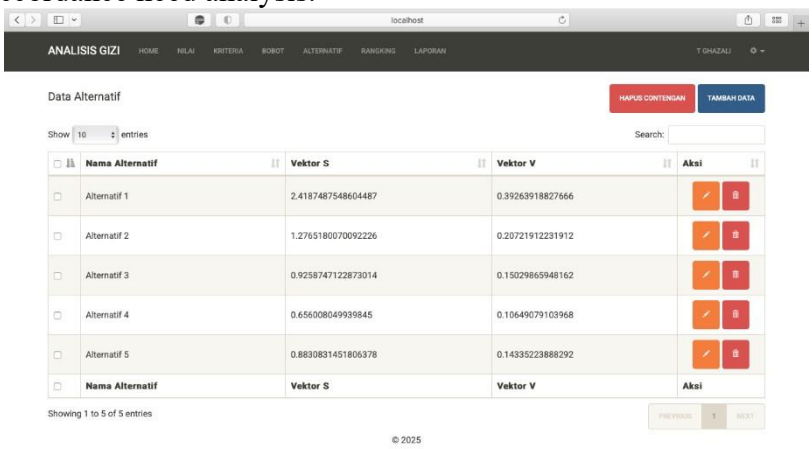


Figure 6. Alternative Data Page

Alternative Data Page is a feature used to manage and display a list of alternatives to be assessed in the Analysis system Nutrition. Alternatives in this context are objects assessment for example types of food or menus analyzed using the Weighted Product (WP) method or comparison method other criteria.

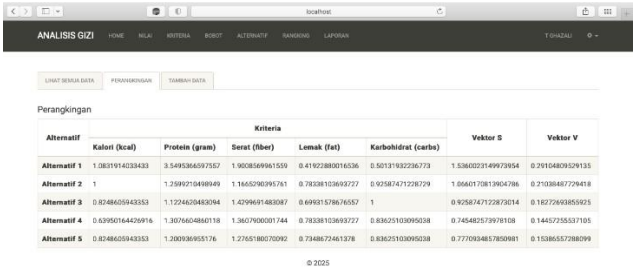


Figure 7. Page Ranking

Page Ranking is feature main in system Analysis Functional nutrition display results calculation as well as order ranking from all over alternative based on method Weighted Product (WP). Page This displaying processes and results end evaluation in a way complete start from mark criteria that have been normalized until Vector S and Vector V as base taking decision. Black Box Testing Method used For test whether every functions in the system walk as expected without see program code. Testing focused on input, process, and output of every feature.

Table 1. Login Page

No	Scenario Testing	Input	Expected Output	Results
1	Login successful	Valid username and password	Login to dashboard	Succeed
2	Login failed	Incorrect username or password	Error message: password “Incorrect username/password”	Succeed
3	Empty input	Username & password are empty	Notification : "Field cannot be empty"	Succeed

Table 2. Analysis Dashboard Nutrition

No	Scenario Testing	Input	Expected Output	Results
1	Access dashboard	Admin login	The dashboard appears complete (value preferences, criteria, weights, ranking results)	Succeed
2	Access without login	Not logged in	Redirected to login page	Succeed

Table 3. Preference Value Data Page

No	Scenario Testing	Input	Expected Output	Results
1	Add value preference	New data (name values number)	Data is saved and appears in the table	Succeed
2	Edit data	Change value	Data is updated in the table	Succeed
3	Delete data	Click delete	Data deleted from table	Succeed
4	Empty input	Empty form	notification "Data cannot be empty"	Succeed

Table 4. Criteria Data Page

No	Scenario Testing	Input	Expected Output	Results
1	Add criteria	Criteria name, attribute (cost/benefit)	Criteria stored	Succeed
2	Edit criteria	Change name or attributes	Criteria updated	Succeed
3	Wipe criteria	Click delete	Criteria deleted	Succeed
4	Empty input	No content name / attribute	Notification error	Succeed

Table 5. Weight Data Page

No	Scenario Testing	Input	Expected Output	Results
1	Add weight	Valid weight value	Weight stored	Succeed
2	Edit weight	Change weight	Changes saved	Succeed
3	Wipe weight	Click delete	Weight deleted	Succeed
4	Invalid weight	Number < 0 or empty	A validation error appears	Succeed

Table 6. Alternative Data Page

No	Scenario Testing	Input	Expected Output	Results
1	Add alternative	Food name + value criteria	Alternative data stored	Succeed
2	Edit alternative data	Change value nutrition	Updated data	Succeed
3	Wipe alternative	Click delete	Data deleted	Succeed
4	Empty input	Not filling mark nutrition	Error message	Succeed

Table 7. Ranking Pages (WP)

No	Scenario Testing	Input	Expected Output	Results
1	Calculate ranking	Click on WP process	A table appears calculation (normalization, S, V)	Succeed
2	Show the final result	Complete alternative data	WP rankings are displayed in the correct order.	Succeed

3	Incomplete data	There is value empty criteria	The message "Data is incomplete" appears.	Succeed

Table 8. Logout

No	Scenario Testing	Input	Expected Output	Results
1	Click the logout button	—	User logs out and returns to login	Succeed
No	Scenario Testing	Input	Expected Output	Results
2	Access the page after logout	Not logged in	Redirected to login page	Succeed

Based on testing using the Black Box method, all function main system from login, data management, Weighted Product (WP) calculations, to The ranking has gone as expected. Nothing found errors in the input-process-output flow, so that the system is deemed suitable for use as a supporting tool decisions in choosing a healthy diet menu.

Conclusion

Based on results research, system Website -based Decision Support (DSS) is successful built For help users in determine a healthy diet menu in accordance need nutrition they. System This provide feature management criteria, weight, value preferences, as well as alternative food, so that users or admin can updating data whenever needed. The Weighted Product (WP) method has been proven effective used in the calculation process healthy diet menu recommendations. WP is capable process Lots criteria like calories, protein, fat, carbohydrates, and fiber in a way simultaneously, as well as produce mark objective ranking based on the weight given. The calculation process includes normalization weights, vector S, and vector V can walk with good inside system. The results of the Black Box test show all over functions in the system walk with correct and appropriate need. Start from login, data management (criteria, weight, value) preferences, alternatives), to the ranking process all feature has functioning without error. With Thus, the system worthy used as analysis tools nutrition and selection food.

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