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COMPARISON OF OUTSTANDING EMPLOYEE SELECTION AT BENU COFFEE ROASTER USING BROWN-GIBSON AND SIMPLE ADDITIVE WEIGHTING (SAW) METHODS

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ABSTRACT

The selection of outstanding employees at Benu Coffee Roaster is carried out to increase employee enthusiasm at work. The Brown-Gibson method and Simple Additive Weighting (SAW) can be used to assist management in selecting outstanding employees who have qualities and abilities that suit the company's needs. The Brown-Gibson method is used to calculate employee performance levels based on several predetermined performance indicators. Meanwhile, the Simple Additive Weighting (SAW) method is used to rank employees based on previously calculated performance values. This research was conducted by collecting employee achievement data through interviews, observation, and data collection from the company's management system. The data that has been collected is then processed and analyzed using the Brown Gibson and Simple Additive Weighting (SAW) methods. The research results show that the system developed can contribute to management in selecting outstanding employees more efficiently and accurately. By using this system, management gains new knowledge in selecting outstanding employees more quickly and effectively, as well as minimizing mistakes in selecting outstanding employees.

Keywords: *Decision Support System, Brown Gibson, Simple Additive Weighting, Benu Coffee, DBMS*

1. INTRODUCTION

One very important element of the company is Human Resources. The management of the Human Resources of a company greatly affects many aspects that determine the success of the work of the company. If Human Resources can be managed properly, it is hoped that the company can carry out all its business processes properly. Benu Coffee Roaster was established on October 17, 2018 now it already has 3 branches, namely Banda Aceh, Langsa Aceh, and Medan Johor. It continues to move forward with its progress in the field of coffee drinks. Benu Coffee Roaster conducts the selection of outstanding employees to spur employee enthusiasm in increasing employee loyalty and loyalty to the company and to evaluate employee performance from each division.

The advantage of the Brown-Gibson method is that it minimizes distance, time, and cost and the advantage of the SAW method is that it can determine the weight value of each attribute, then proceed with the ranking process which will select the best alternative from several alternatives and assessments, it will be more precise because it is based on predetermined criteria values and preference weights.

The selection of outstanding employees is carried out periodically or periodically but has not been optimal in its implementation. Benu Coffee Roaster found obstacles in determining the selection of outstanding employees. The obstacle faced is that no system/method can handle employee performance appraisal problems with many criteria. In addition, it is difficult to select outstanding employees due to the large number of employees being assessed. This is a shortcoming in determining whether or not someone is selected as an outstanding employee.

In the 1970s, Scott-Morton brought up for the first time the concept of a decision support system. Support system as an interactive system in decision-making to handle various structural and unstructured problems using computer-based data and models. In this research, the methods implemented in C# (CSharp) are Brown Gibson and SAW methods.

The Brown-Gibson method is a method used to analyze alternatives, which was developed based on the concept of "preference of measurements" combined with objective and subjective factors. Objective factors in the form of cost-effectiveness, namely the total cost incurred for one alternative. Subjective factors in the form of weighting in decision-making on the criteria required for determining the selection of outstanding employees.

The Simple Additive Weighting (SAW) method is a weighted sum method. The basic concept of Simple Additive Weighting (SAW) is to find the weighted sum of the performance ratings on each alternative on a criterion. The Simple Additive Weighting (SAW) method requires a normalization process of the decision matrix (X) to a scale that can be compared with all existing alternative branches.

The use of the Brown Gibson and SAW methods aims to help select the best employees with easy and fast steps by entering the names of employees and abilities possessed by employees into the system, then the system will provide conclusions according to the value/weight of ranking the selection of outstanding employees.

Based on the background that has been described, the authors will conduct research with the title "Decision Support System for Comparison of Outstanding Employee Selection at Benu Coffee Roaster by Using the Brown Gibson and SAW Methods".

1.1 Research Design

The research design in this paper is as follows:

1. Literature Study

   In this research, the author uses the library study method or literature study to review and collect various references from books, journals, reports, and other literature reviews that are related to the research to be conducted.

2. Role System

   System design is carried out in the form of system flowcharts, activity diagrams, use case diagrams, sequence diagrams, and application creation.

3. Implementation System

   The implementation of the system to be carried out is built according to the design made using the desktop-based C# (CSharp) programming language.

4. System Testing

   The system that has been created will be tested to see and ensure that the system is running properly

1.2 System Design

System design is carried out in the form of system flowcharts, activity diagrams, and application development.

1.3 System Implementation

Implementation of the system to be carried out is built by the design made with the desktop-based C# (CSharp) programming language.

1.4 System Testing

The system that has been created will be tested to see and ensure that the system runs properly.

2. LITERATURE REVIEW

2.1 Brown Gibson Method

The Brown-Gibson method is a method used to analyze alternatives, which was developed based on the concept of "preference of measurements" combined with objective and subjective factors [1]. The objective factor is cost-effectiveness, namely the total cost incurred for one alternative. Subjective factors in the form of weighting in decision-making on the criteria required to determine the selection of the best employee. The Brown-Gibson method by two researchers named Philip Brown and David Gibson in 1972. The Brown-Gibson method can be used to help analyze data in a multi-attribute decision-making process [2].

Steps to Make a Support System in the Brown-Gibson Method

The steps using the Brown Gibson method in the Support system are:

1. Elimination of each choice is not feasible and feasible to choose, based on technical considerations, or other utilities in the capacity of the required alternative and can be used as a reason to eliminate an alternative in the alternative nomination list.
2. Calculate and determine the performance measurement of the objective factor (OF_i) for each alternative. The performance measure for the objective factor is calculated based on the estimation of all estimates of the total costs incurred for the alternative. The performance measure for the objective factor is calculated based on the estimation of all estimates of the total costs incurred for the alternative estimates.

$$OF_i = \left[C_i \times \sum \left(\frac{1}{C_i}\right)\right]^{-1}$$

Where:
$\sum OF_i$ = 1
C_i = total estimated cost estimate
OFi = objective factor
i = number of samples

3. Determine the factors that have a significant influence and must be considered in an alternative selection. These factors are subjective. Estimation of the size of the subjective factor performance factor (Si) for each choice is determined by the formula:

$$SF_i = \sum W_j \times R_{ij}$$

$\sum SF_i$ = 1
i = number of alternatives
j = number of subjective factors = 1,2,3. n
W_j = factor rating using "forced choice pairwise comparison"
R_{ij} = subjective factor ranking of each alternative ($0 < R_{ij} < 1$)
$\sum R_{ij}$ = 1

The "forced choice pairwise comparisons" method in principle is to compare and rate a subjective factor against subjective factors in pairs (pairwise) based on:
a. Better Point = 1
b. Equally Good Given Each Point = 1
c. Equally Bad Given Points Each = 0
d. Poorer Given Point = 0

4. Make a weighting, which is better to consider, between objective factors (weight = k) and subjective factors (weight = k-1) from the limit value ($0 < k < 1$). Combine objective factors (OF_i) with subjective factors (SFi) which will produce a "location preference measure" (LPMi) for each alternative. Mathematically shown by the formula:

$$LPM_i = k(OF_i) + (1 - k)(SF_i)$$

Where:
$\sum LPM_i$ = 1
LPM_i = location preference measure value on the calculation alternative object
K = objective factor weight
1-k = subjective weight factor
OF_i = objective factor
SF_i = subjective factor

Decisions are made based on choices that have the largest LPMi value. The data needed in designing this outstanding employee selection decision support system consists of criteria, prospective recipients, and assessments.

2.2 Simple Additive Weighting (SAW) Method

According to Fishburn and MacCrimmon, Simple Additive Weighting (SAW) is one of the many methods applied in facilitating decision support that has several attributes [3]. Used to determine the best choice from many existing alternatives. The Simple Additive Weighting (SAW) method is one of the many problem solvers known as weighted summation. The basic design of the SAW method is to find the weighted sum of each performance value on each option (alternative) of all available attributes which ultimately results in the best choice (alternative) option.
According to Fishburn and MacCrimmon. There are several steps in completing the Simple Additive Weight (SAW) method as follows:

1. Determine the alternative, namely A_i.
2. Determine the criteria that will be used as a reference in decision-making C_i.
3. Determine the preference weight or importance level (W) of each criterion. W = [W_1 W_2 W_3 ... W_n]
4. Create a match rating table for each alternative on each criterion.
5. Create a decision matrix X formed from a table of match ratings of each alternative (A_i) on each predetermined criterion (C_j) where i = 1, 2... m and j = 1,2, ..., n.
6. Normalize the decision matrix X by calculating the normalized performance rating value (r_{ij}) of the alternative (A_i) on performance (C_j).
7. The results of the normalized performance rating value (r_{ij}) form a normalized matrix (R).

2.3 Database Management System (DBMS)

DBMS is a software system that allows users to describe, create, maintain, and organize access to databases. DBMS is a set of programs that provides users with tools to add, delete, access, and analyze data stored in one location [4]. DBMS is a formal specification tool and verification of the security model for database / SQL operations. It is concluded that DBMS is a software system used to add, delete, access, and manage access to the database.

2.4 XAMPP

XAMPP is software that includes a MySQL server and is supported by PHP as a programming language for creating dynamic websites and there is an Apache web server that can be run on several platforms such as OS X, Windows, Linux, Mac, and Solaris. States that XAMPP has available database servers such as MySQL and PHP programming. XAMPP has the advantage that it is quite easy to operate, does not require costs, and supports installation on Windows and Linux [5]. Another advantage that is obtained is that only one installation is required and then MySQL, apache web server, database server PHP support (PHP 4 and PHP 5) and several other modules are available. From the above understanding, it is concluded that XAMPP is Apache server software that has many advantages such as being easy to use, does not require costs, and supports Windows and Linux installations. This is also supported because with a one-time installation, MySQL, apache, web server, and database server PHP support is available.

2.5 Relevant Research

Research related to the Decision Support System in the Brown-Gibson method and the SAW method is as follows:

1. Research with the title "Simple Additive Weighting Method on Intelligent Agent for Urban Forest Health Monitoring"[6]. This study aims to provide the analysis and design of an intelligent agent as a decision-maker in urban forest health monitoring, with the utilization of the Simple Additive Weighting (SAW) method. The result is the model of intelligent agents who can assist in determining the health level of urban forests.
2. Research with the title "Decision Making of Warehouse Location Selection Using Brown-Gibson Model"[7]. Explained that the Optimized warehouse location improves the profitability of the companies and reduces the risk and uncertainty in the supply chain network.

3. ANALYSIS AND DESIGN

3.1 Design Analysis

The first thing to do when designing a system is to analyze the system. System analysis and design is the first step that will be the foundation in system development to determine the needs and problems that can be overcome from the existence of a system to be built, and what kind of system will be made. System analysis systematically assesses how functions by observing the input process and data output.

Ishikawa diagram is a reactive risk management method by identifying potential causes of a problem to find the root cause of the problem through brainstorming sessions. Ishikawa diagrams are also known as fishbone diagrams or Cause-Effect Analysis. Action and corrective steps will be easier to take if the root cause of the problem has been found. The benefits of Ishikawa diagrams include easy-to-read diagrams of causal relationships so that people are more likely to use this method, knowing the causes of influential problems, increasing productivity, and improving internal and external communication. The Ishikawa diagram in this study is shown in Figure 1. below:

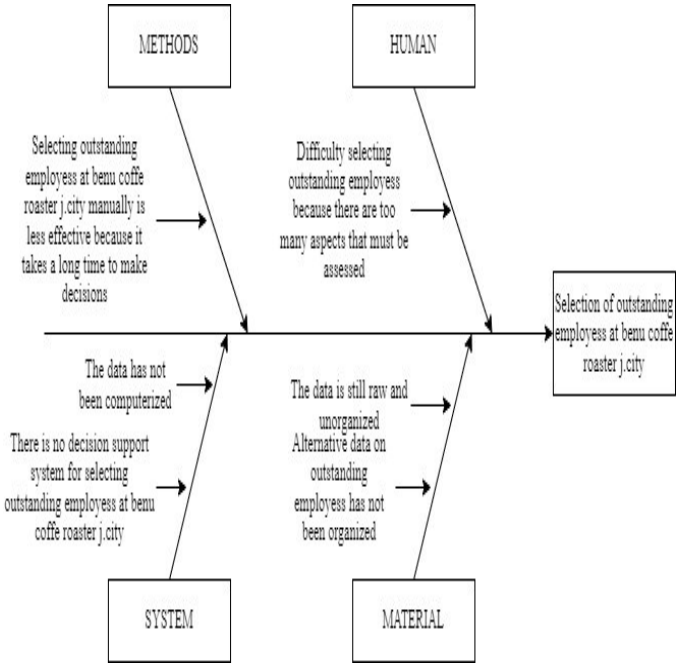

Figure 1. Ishikawa diagram

3.2 Needs Analysis

After the problem is identified, the next step is to determine the needs or needs analysis. Requirements analysis aims to determine what the system must do and define the limits of its operation and implementation boundaries to properly communicate all the functions provided. Requirements analysis can be said to be the process of obtaining information, models, and system specifications that users want. System requirements analysis is divided into two, namely functional needs and non-functional needs.

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3.3 General System Architecture

The general system architecture shows the entire system work process. The general system architecture of this system as shown can be seen in Figure 2. below:

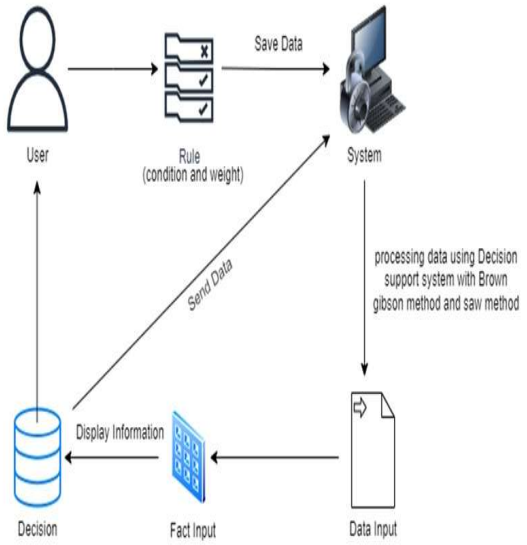

Figure 2. General Architecture

3.4 System Modeling

System modeling is a form of simplification of a very complex element and component to facilitate understanding of the information needed. Modeling is used to simplify complex problems in such a way that it is easier to learn and understand. The system modeling used in this research is a use case diagram, activity diagram, and sequence.

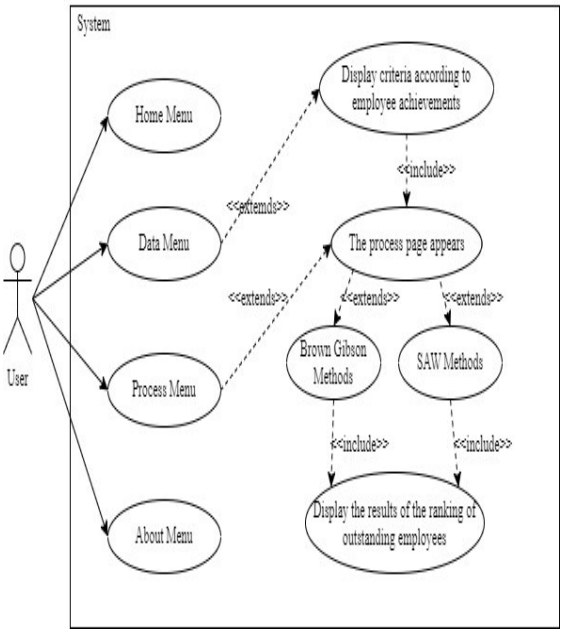

Figure 3. Use Case Diagram

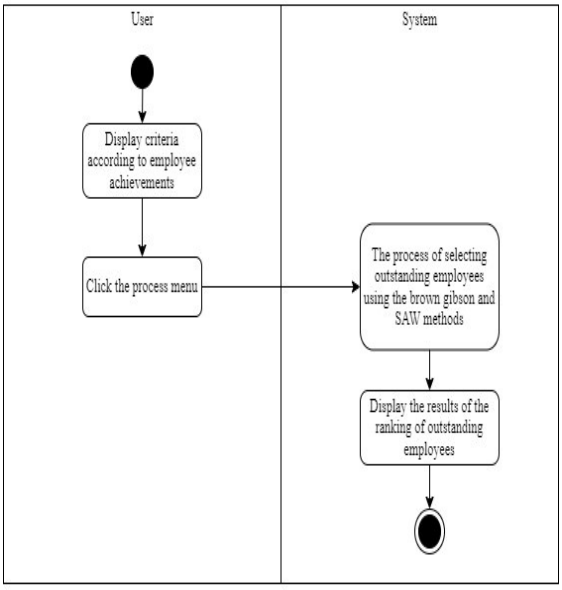

Figure 4. Activity Diagram

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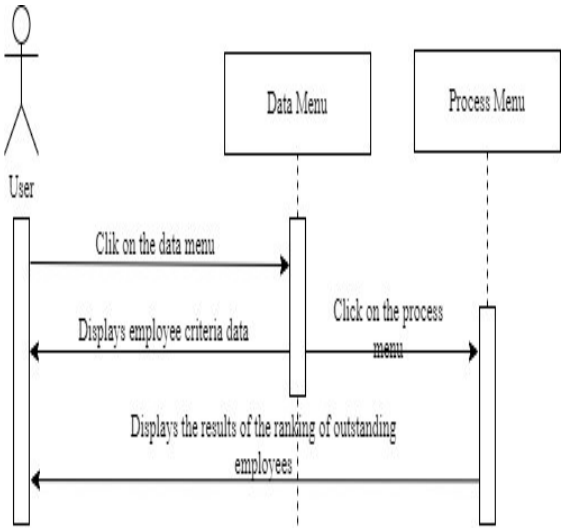

Figure 5. Use Case Diagram

The system that has been created will be tested to see and ensure that the system runs properly.

3.5 Flowchart

A flowchart or flow chart is a graphic depiction of the steps and sequence of procedures of a program. A flowchart is a chart (chart) that shows the flow (flow) in the program or system procedure logically. Each step is depicted in the form of a diagram and connected with lines or arrows. Flowcharts are used primarily as communication aids and for documentation.

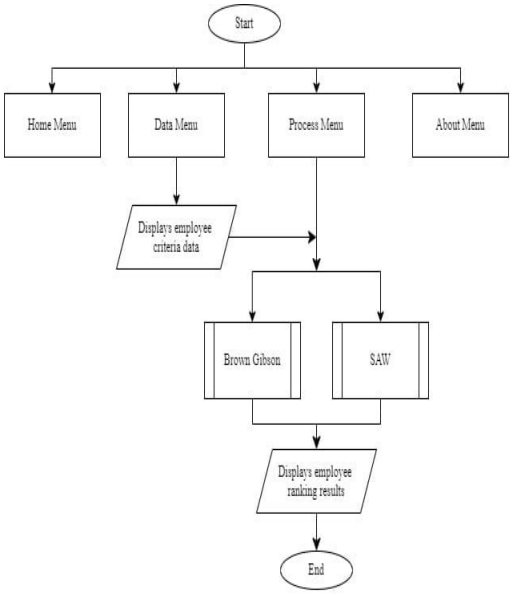

Figure 6. System Flowchart

3.6 Brown Gibson Flowchart

Brown Gibson flowchart is a flowchart for calculating the results of outstanding employee recommendations based on ranking as shown in Figure 7. below:

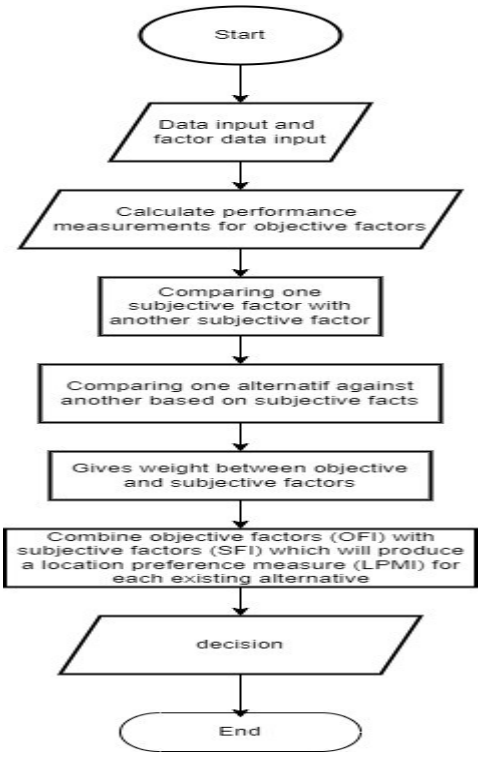

Figure 7. Brown Gibson

Figure 8. SAW Flowchart

3.7 Process Analysis

Process analysis is carried out to find out the work process of the decision support system, the methods used in this research are the Brown-Gibson method and the SAW method. The data needed for the analysis of this research process is about employees at Benu Coffee Roaster.

3.8 Data Collection

In employee data, there are several criteria needed to build a decision support system.

3.9 User Interface

User interface design is a very important structural design stage of a system that aims to facilitate the user's work when running the system to be built.

4. RESULT AND DISCUSSION

In this section, the researcher describes the testing results, user testing, analysis results, and discussion.

4.1 Research Type

The system implementation stage is the stage carried out to complete the system design that has been made, as well as testing the system that has been made. This stage aims to carry out trials of the development concept on the system.

System implementation in this study can use the C# programming language (C Sharp). In this system there are several menus, namely the home menu, data menu, process menu, and about the menu.

4.2 Testing Results

The system testing process will be carried out to find out if the system can run well. This test is done by manually testing the Brown Gibson method and the Simple Additive Weighting (SAW) method, as well as user testing.

Table 1. Comparison of Test Results

Ranking	Brown Gibson Method		SAW Method	
	Employee	Results	Employee	Results
1	Anjas	87.5	Anjas	0.10707
2	Sekar	79.34641	Tari	0.11763
3	Tari	78.23529	Dahlan	0.11931
4	Dahlan	77.45098	Sekar	0.12104
5	Siddiq	73.69281	Wahyu	0.12849
6	Wahyu	73.64379	Siddiq	0.13257
7	Dea	73.26797	Dea	0.1347
8	Ikbal	69.01961	Ikbal	0.13919

4.3 Manual Calculation of Brown Gibson Method

Manual calculation of the selection of outstanding employees by determining the weight value of each of the employee's criteria. Furthermore, initializing data and factor data, performance measurements for objective factors, comparing subjective factors with other subjective factors, giving weight values to objective and subjective factors, and then combining objective and subjective factors to produce location preference measures and ranking.

4.4 Manual Calculation of Simple Additive Weighting (SAW) Method

Manual calculation of the selection of outstanding employees by determining the weight value of each employee criterion. Furthermore, initializing employee assessment data, normalizing the alternative matrix of each criterion, the multiplication process with the weight of the criteria value with employee assessment data, and sorting the value of the results.

4.5 User Testing

To find out how the results of user testing, the questionnaire answers will be processed concerning a Likert scale with a weight of 1 to 5 where Strongly Disagree (STS) is worth 1, Disagree (TS) is worth 2, Neutral (N) is worth 3, Agree (S) is worth 4, and Strongly Agree (SS) is worth 5. To determine the percentage in each variable using the following equation.

4.6 Analysis of Results

Based on user testing on the outstanding employee selection system at Benu Coffee on 11 respondents through a questionnaire, the total score of each question is 97.73% + 80.00% + 80.00% + 96.36% + 78.18 + 78.18% = 505.45%. Then the average value of the total % score is 505.45% / 6 = 84.24%. Based on the results of the calculation and referring to the score interval table (Table 1), it can be concluded that the average number of %scores is classified as a Strongly Agree category. Therefore, it can be said that the system that has been made is easy to use by this user.

4.7 Discussion

1. The alternative data on outstanding employees available in the study is still static, therefore for further research, it is hoped that it can be dynamic where you can add, change, and delete the data using the CRUD method.

2. For further research, it is expected to add an account login feature so that it can be accessed by certain users.
3. For further research is expected to develop a mobile-based to facilitate the use of these users.

4.8 Difference from Prior Work

1. Research with the title "Simple Additive Weighting Method on Intelligent Agent for Urban Forest Health Monitoring"[6]. This study aims to provide the analysis and design of an intelligent agent as a decision-maker in urban forest health monitoring, with the utilization of the Simple Additive Weighting (SAW) method. The result is the model of intelligent agents who can assist in determining the health level of urban forests. In this study only used the Simple Additive Weighting (SAW) method, while we compared two methods, namely the Brown-Gibson method and Simple Additive Weighting (SAW).
2. Research with the title "Decision Making of Warehouse Location Selection Using Brown-Gibson Model"[7]. Explained that the Optimized warehouse location improves the profitability of the companies and reduces the risk and uncertainty in the supply chain network. In this study only used the Brown Gibson method, while we compared two methods, namely the Brown Gibson method and Simple Additive Weighting (SAW).

5. CONCLUSION

The research results show that the system developed can contribute to management in selecting outstanding employees more efficiently and accurately. By using this system, management gains new knowledge in selecting outstanding employees more quickly and effectively, as well as minimizing mistakes in selecting outstanding employees. The outstanding employee selection system at Benu Coffe can provide ranking results based on the provisions of the weight value by utilizing the use of Brown-Gibson method and the Simple Additive Weighting (SAW) method. To answer these problems can be done by identifying criteria, collecting data, normalizing data, weighting criteria, calculating Brown Gibson and SAW methods, and ranking. Obtained an average of the number of scores in the percentage of the questionnaire results on the system of 84.24% and classified as a Strongly Agree category. Therefore, it can be said that this outstanding employee selection system can function properly in providing relevant ranking results according to the needs of these users.

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