Decision Support System of Social Assistance in Bitung City by using AHP Method

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Abstract: Information and data from all SKPs under the Bitung City Government are integrated in a data center. So, they can be accessed in real time by users, both government and community. There are several algorithms that can process data and provide the desired information such as Data Mining, Artificial Intelligence and Decision Support Systems. Decision Support System is a computer system application that can assist decision makers in solving problems. In addition to population problems, a decision support system can help government to solve social problems. In this study, we created a decision support system using the Analytical Hierarchy Process (AHP) algorithm which will calculate optimal decisions in solving population and social problem. This system will be used to calculate the priority of social assistance in Bitung City.

1 INTRODUCTION

Bitung City is a Maritime City which is the only Special Economic Zone in Sulawesi. Bitung City is a maritime city where most of the people depend on the sea and beach products such as fishing industry, coastal tourism, fish canning factories and ports. As we know that Bitung City has the largest seaport in Eastern Indonesia. Given its very strategic location as a maritime city, most of the city's revenue comes from the maritime sector. To improve the economy and income of the people of Bitung City, the government needs an integrated and reliable information system. If it is not supported by a good reliable information system, the management of resources in Bitung City will not be optimal given the limited human ability to manage information manually. Therefore, this becomes a serious problem because valuable data and information in Bitung City cannot be accepted and utilized properly by the community due to lack of knowledge and utilization of information technology. To realize Bitung City as a Digital City, an Integrated Big Data system is needed to be able to quickly access data and information stored in the Data Centre. The stored data in the system can be a population data, employment, correspondence and so on. These data can be used to find solutions for all problems that occur in the community. For example, population data that must be assisted economically by the data on fishermen that must be assisted in the procurement of fishing equipment, fishery industry data, scholarships for those who cannot afford but excel, data on marine natural resources that can be used for evaluation in inviting tourism investors, as well as marine tourism data that can be developed or new tourism potential areas according to the appropriate parameters and criteria. In determining the beneficiaries and analizing these investments, they still use manual evaluation by decision-making employees. This results are dishonest and subjective results. Likewise, the results obtained by the analizing of population data are very inaccurate due to invalid data and limited human memory capacity in determining the priority of beneficiaries. Therefore, a computer application integrated with Bitung City Big Data is needed in the form of a Decision Support System. The Decision Support System that will be made is using the AHP method which is known to be very accurate in calculating the statistical problem. Population data can be retrieved and collected quickly. So, the data can be used directly to be calculated and aggregated based on criteria and as a final result is the order of priorities and optimal decisions that must be taken. This decision support system can solve many social problem in Bitung City.

2 RESEARCH LITERATURE

2.1 Decision Support System

Decision Support System (DSS) is a system that interactively provides information, modeling, and data manipulation where the system is used to assist decision making in semi-structured and unstructured problems, where no one knows for sure how decisions should be made (Alter , 2002). Decision Support Systems (DSS) are generally built to find a solution to a problem with several available options (alternatives) based on knowledge, or evaluate an opportunity based on existing data. Where the decision support system is called the DSS application. To find solutions to certain unstructured management problems, DSS applications use a flexible, interactive, and adaptable CBIS (Computer Based Information System) (Kusrini, 2007).

The objectives of the Decision Support System are (Turban, 2005):

1. Assist managers in making decisions on semi-structured problems.

2. Provide support for the manager's judgment and is not intended to replace the manager's function.

3. Increasing the effectiveness of decisions taken by managers more than improving their efficiency.

4. Computing speed.

5. Increased productivity.

6. Quality support.

7. Competitive.

8. Overcome cognitive limitations in processing and storage.

2.2 Analitical Hierarkhi Process (AHP)

The main principle of the AHP method is to enter human perception into a functional hierarchy. In solving decision-making problems using the AHP method, the following are the principles that must be understood (Kusrini, 2007):

1. Create a Hierarchy

A complex system of problems can be better understood by breaking it down into supporting elements, arranging the elements hierarchically, and combining them or synthesizing them.

2. Assessment of criteria and alternatives.

This assessment is carried out by pairwise comparisons in the matrix. According to Saaty (1988), a scale of 1 – 9 is the best representation for expressing opinions on a problem.

3. Determine Priorities.

For each criterion and alternative, a pairwise comparison must be made. The relative comparison value of all alternative criteria can be adjusted according to the predetermined judgment to produce weights and priorities by manipulating the matrix or by solving mathematical equations.

4. Logical Consistency (logical consistency)

Consistency is the first where similar objects can be grouped according to uniformity and relevance. Second, it concerns the level of relationship between objects based on certain criteria.

Basically the procedures or steps in the AHP method consist of (Kusrini, 2007):

1. Defining the problem and determining the desired solution, then compiling a hierarchy of the problems encountered.

2. Determine the priority of the elements.

3. Synthesis.

Consideration of synthetic pairwise comparisons to produce overall priorities.

4. Measuring consistency

The final result of this step yields max

5. Calculate the consistency of the Index using the following formula:

$$CI = (\lambda, max - n) / n \quad (1)$$

where n = number of elements

6. Calculate the Consistency Ratio (CR) using the following formula:

$$CR = CI/IR \quad (2)$$

Where CR = Consistency Ratio

CI = Consistency Index

IR = Index Random Consistency

7. Check the consistency of the hierarchy with the following tests:

If the CR value is more than 10% (0.1), then the assessment of the data is inconsistent and must be corrected. And if the CR value is less than or equal to 10% (0.1), then the data assessment is correct.

3 RESULT

3.1 Dashboard (Main Page)

Figure 1: Dashboard.

The figure 1 shown the main page of the decision support system. User can get information about the population data, decision support system, the system process, and the result of the decision support system.

3.2 Information Page

This page consist of the information about the value of criteria in the decision support system. The value is shows the priority of the criteria.
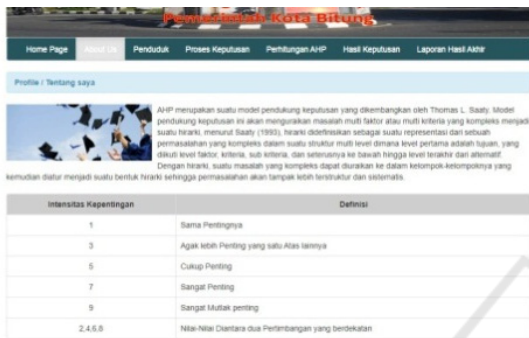

Figure 2: Information Page.

3.3 Demography Data

This page shows the job of the people, salary, additional salary, dependents, and expense. Base on this criteria, we decide the value. This value will be used to calculate the final mark and rank of the person.
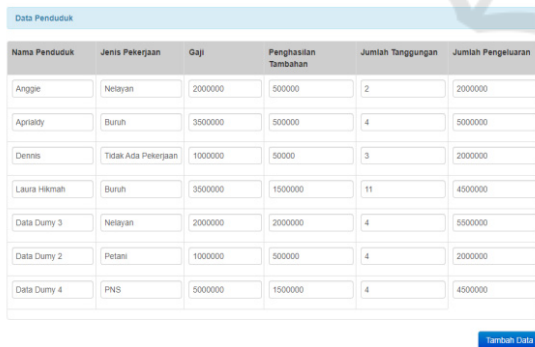

Figure 3: Demography Data.

3.4 Demography Data Entry

We will fill-in the data in the figure 4 completely to calculate final value and the rank. There are the fields of the name of the head of family, Regency Registration Number, Occupation, the monthly income, additional income, the number of family and the monthly expense.

Figure 4: Demography Data Entry.

3.5 Value Criteria in AHP

We can set the value of criteria matrix by input the all value in the empty box below. The figure below is called 'pairs matrix'. The priority of criteria are:

1. The Salary

2. Expense

3. The Dependents
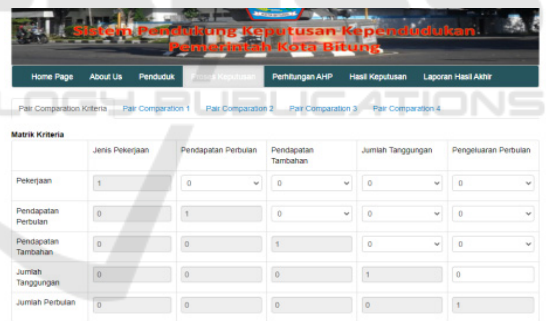
4. Additional Salary

5. The Job

Figure 5: Pairs Matrix.

3.6 Process of Decision Support System

After fill-in the value of pair matrix, we can calculate the valid of our AHP values. The values of Consistency Index and Consistency Ratio must be less then 1. So, the value of CI and CR below is less than 1, it means that the matrix is good and can be used.

	Jenis Pekerjaan	Pendapatan Perbulan	Pendapatan Tambahan	Jumlah Tanggungan	Pengeluaran Perbulan	Priority Verctor
Jenis Pekerjaan	1	2	4	4	2	0.45
Pendapatan Perbulan	0.50	1	4	4	2	0.32
Pendapatan Tambahan	0.25	0.25	1	4	0.15	0.08
Jumlah Tanggungan	0.25	0.25	0.25	1	0.08	0.12
Pengeluaran Perbulan	0.50	0.50	0.50	0.5	1	0.08
Jumlah	2.00	3.50	9.25	13.00	7.00	1.12

Principle Eigen value(max)	4.58
Consistency index(CI)	0.19
Consistency Ratio(CR)	0.21%

Figure 6: Value CI dan CR.

3.7 Report of Rank Social Assesment

Finaly, we can calculate the all value of criteria based on the value in pair matrix to get the final value and rangking. It's shown by the figure below. There several value are not accept because they not fulfil the criteria of social assist. The top ranking are more priority than the ranking below. So we can calculate the final value and list the ranking to show who has the higher priority of social assist.

Figure 7: Report of Calculation and Ranking.

4 CONCLUSIONS

The Result shows that the decision support system can calculate the value of criteria to get the final score with its ranking of priority. In this system we can decide the value of each criteria and have the calculation of the validity of our pair matrix. By this system the asesment of the social assistance will be more fair and accurate because the people has no interference to decide the score and ranking. This system can make report automatically to have a transparency result.

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