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Selection of Tourist Destinations in the Thousand Islands (*Kepulauan Seribu*) Based on the Preference Value of the Simple Additive Weighting Method

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ABSTRACT

One of the potentials that can improve the economy of local communities is development in the tourism sector. *Kepulauan Seribu* is an archipelago area in the north of Jakarta, this area has tourism potential in the form of a cluster of islands. This group of islands has different characteristics to be used as a tourist attraction, including marine tourism, historical tourism and nature reserve tourism (conservation). Islands that have historical tourism potential are the reason for conducting research related to the selection of tourist destinations in the *Kepulauan Seribu*, such as Kelor, Onrust and Cipir island. The obstacles of the community in finding the right tourism potential are still lacking information from the aspects of attractions, accessibility and facilities. To assist tourists in choosing a place, a decision support system is needed that can be completed using the Simple Additive Weighting method. There are five assessment criteria including scenery, photo spots, transportation, toilets and places to eat/resto. Determination of weights on criteria using a statistical approach from the questionnaire results. The result of the preferred tourist recommendation preference value is the island of Kelor because there are seven highest scores obtained by the island compared to Onrust and Cipir island.

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1. INTRODUCTION

One of the great potentials that can improve the economy of local communities is the development of the tourism sector, this can be realized when it is able to be managed professionally, effectively, and efficiently. In its development, tourist attractions must certainly have an attraction and leave their own impression so that they can attract the attention of tourists. Tourism is a series of travel activities carried out both individually and family trips as well as groups from their original place of residence to various other places only with the intention of making tourist visits and not for work or to earn income in the place where it is intended [1].

Meanwhile, according to Law Number 9 of 1990 concerning tourism, it is explained that tourist attractions are something that is targeted by tourism, including; tourist attractions created by God Almighty in the form of natural conditions, flora and fauna, as well as tangible human works

such as museums, historical relics, art and culture, agro-tourism, buru, nature adventure tourism, recreational parks and entertainment complexes, and special interest tourist attractions, such as hunting, mountain climbing, caves, industry and crafts, shopping places, rushing water rivers, places of worship, places of pilgrimage and so on. Then if there are three factors supporting tourist objects and attractions, including; Tourist attractions are everything that can attract tourists to visit a tourist destination area, accessibility is the availability of facilities and infrastructure that can be used for tourists to a place that is a tourist destination, facilities, all supporting facilities for tourists' activities while in and towards tourist destinations [2].

Kepulauan Seribu is an archipelago area in the north of Jakarta, this area has tourism potential in the form of a cluster of islands. This group of islands has different characteristics to be used as a tourist attraction, including marine tourism, historical tourism and nature reserve tourism (conservation) [3]. Historical tourism in the *Kepulauan Seribu* has its own charm judging from the historical relics of the Netherlands before Indonesian independence. Some of the islands that are included in the category of historical tourism islands are Onrust Island, Pular Kelor and Cipir Island (Khayangan). Onrust Island has a historical attraction which was previously a VOC shipyard and was also used as a Hajj Quarantine building. Kelor Island has historical tourist characteristics of Martello Fort which was a defensive fortress during the Dutch colonization. Cipir Island has the rest of the historical buildings in the form of a fortress complete with Dutch cannons. Islands that have historical tourism potential are reasons for research related to the selection of tourist destinations in the Thousand Islands.

The obstacles of the community in finding the right tourism potential to visit in the thousand islands are still lacking information in terms of facilities, accessibility and tourist attractions. To assist tourists in choosing a place requires a decision support system where this system is the application of computer science to make semistructured or unstructured decisions by utilizing data, models, and knowledge. A method is needed in the decision-making process, in this case the Simple Additive Weighting (SAW) method was chosen by the researcher as the method used to solve this problem. SAW method makes it easy to visualize weighting results and calculate based on criteria [4]. In addition, it is also simple to calculate, so it is very fast and easy in testing various cases [5].

Preference value determination is an important part of a decision maker [6]. SAW method has the basic concept of looking for weighted summation of performance ratings in each alternative. So that the SAW method is also known as the weighted summation method. In the process of calculation, the SAW method has a process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternative values [7][8].

Several previous studies related to the selection of tourist destinations have been carried out. As an example of research related to the implementation of the AHP-SAW method in the selection of the best tourist villages, in his research the AHP method is used in determining the weight of the criteria and for the process of normalization and determination of preference values using the SAW method, out of ten alternatives produced Pemuteran is the most popular tourist village [9]. The combination of AHP SAW methods is also used in determining tourist destinations [10]. Research related to the SAW method in determining tourist destinations in Kendal, in its research the SAW method is used in determining the weight of criteria and preference values, the best tourist attraction from the results of this study is the Tirto Arum Baru tour [11]. The novelty raised in this research topic is related to the determination of tourist destinations in the Thousand Islands using the SAW method, from this method will be weighted criteria to determine the preference value of each alternative. In the process of weighting in this study was carried out with a questionnaire technique that was different from previous studies.

2. RESEARCH METHOD

The data sources in this study used primary data. Primary data is data that is collected and then carried out a data processing process [12]. Primary data collection is carried out through the dissemination of questionnaires. Through the technique of distributing this questionnaire, it was also carried out in previous studies, such as research on decision support systems for determining

shopping tourism in Batam City [13], with the same technique also carried out on decision support research for the selection of tourist attractions in Karangasem Regency [14]. This study also used a questionnaire technique, there were eight likert scale questions with a scale of 1 – 5 which were answered directly by respondents. The respondents of this study were tourists who visited the Thousand Islands, especially Kelor Island, Onrust Island and Cipir Island. There were forty-five data processed in this study.

Decision making process goes through several phases, including intelligence, design, choice and implementation [15][16][17]. Intelligence is a search carried out by identifying information on problems that occur in determining tourist destinations in the *Kepulauan Seribu*. Design formulates the assessment criteria and weight criteria used in obtaining the results of recommendations for tourist destinations in the *Kepulauan Seribu*. Choice carried out the selection process of the Simple Additive Weighting method as a solution used in the selection of tourist destinations in the *Kepulauan Seribu*. In the implementation stage, the decision makers carry out the selected solving action at the election stage. Successful implementation is characterized by the answering of problems [5]. From the decision-making phase, a report on the implementation of the solution was obtained and the result was in the form of determining the decision on the recommendation of tourist destinations contained in the *Kepulauan Seribu* based on the preference value generated by the SAW method. The same stages in determining decisions are also used in a study on determining culinary places in Bekasi [18]. Figure 1 illustrates the stages in decision making.

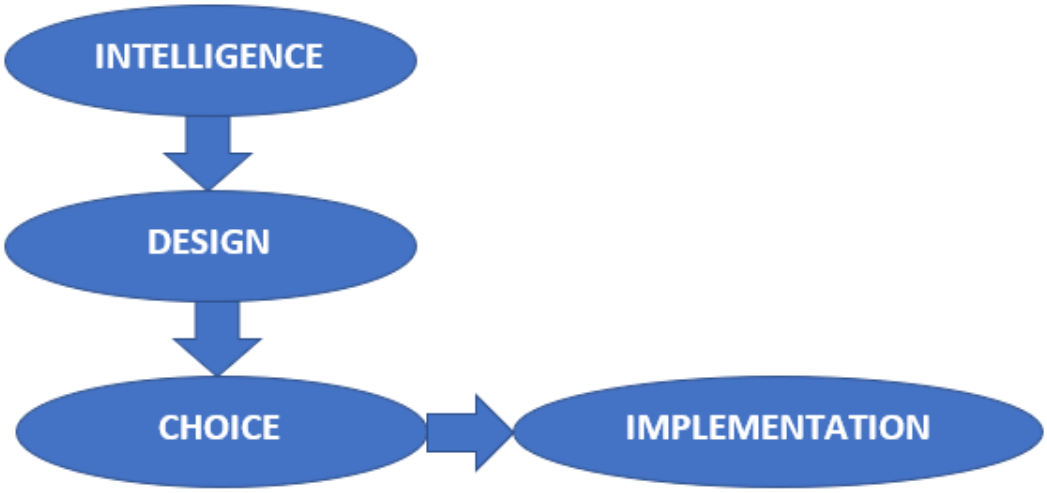

Figure 1. Decision Support Process Flow

The decision support method used is Simple Additive Weighting (SAW). SAW method has several stages of the process, including 1) determining the criteria, 2) weighting each criterion, 3) making an alternative match rating to each criterion, 4) determining the normalization of the matrix and 5) determining the value of preferences in generating decisions [19].

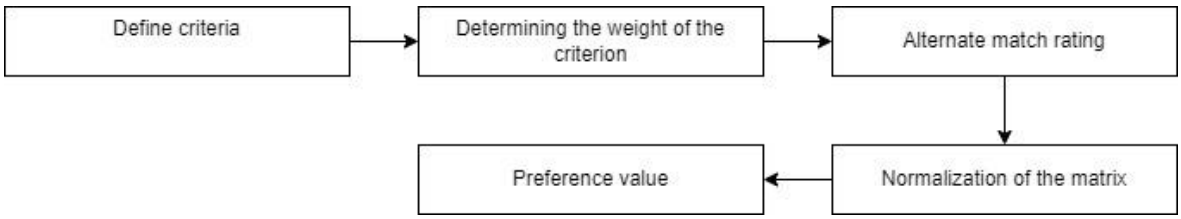

Figure 2. Simple Additive Weighting Method Process Flow

The results of the preference value from the SAW method were carried out a comparative analysis to determine the alternative that obtained the highest preference value [20]. The highest preference value is the chosen and recommended alternative, such as the Nagoya Hills shopping attraction was chosen because it has the highest preference value compared to other alternatives [13]. The same thing is also used in determining Thousand Islands tourism, where the alternative that has

the highest preference value will be the main tourist destination recommendation compared to other alternatives.

3. RESULTS AND ANALYSIS

3.1. Determination of Criteria

The determination of the criteria used in the selection of tourist destinations refers to three factors supporting tourist objects and attractions, namely attractions, accessibility and facilities. Attractions are attractions that make tourists want to visit and see firsthand to an interesting place, such as scenery and photo spots [2]. Accessibility is an indication of infrastructure that can be used to reach a tourist attraction, such as transportation facilities that can be used to reach tourist destinations. Amenity or facilities are facilities and infrastructure available in tourist attractions that make it easier for tourists to be able to meet their needs while in tourist destinations, such as toilets and places to eat/resto [21]. There are five assessment criteria used in this study which include attractions, accessibility and amenities, namely scenery, photo spots, transportation, toilets and resto.

3.2. Determination of Weight Criteria

Weights are the values of a criterion indicator. In general, there are several techniques commonly used in determining the weight of criteria in decision support systems, such as the percentage approach, the fuzzy logic approach and the actual value approach [15]. Another technique that can also be used in determining the weight of criteria is a statistical approach in assessing sampling data, one of which is the likert scale technique. Determining the weight of the criteria in this study with the likert scale technique obtained from the questionnaire filled out by the respondents, the weighting of the criteria with the likert approach is also used in determining shopping tourist attractions [13].

The results of the questionnaire distribution obtained data that chose very important for the sight criteria of 6 respondents, the photo spot criteria were 9 respondents, the transportation criteria were 2 respondents, the toilet criteria were 13 respondents and the dining criteria were 2 respondents. From the data it is then converted in decimal form and when totaled the entire weight of the criterion amounts to 1. The criteria weight determination data as presented in Table 1.

Table 1. Criterion Weight Determination Data

Criteria	Code	Atribute	Weight
Views	C1	*Benefit*	0.188
Photo Spot	C2	*Benefit*	0.281
Transportation	C3	*Benefit*	0.063
Toilet	C4	*Benefit*	0.406
Resto	C5	*Benefit*	0.063

3.3. Match Value Determination

Determination of the match value of each criterion is made with a decision matrix (X) obtained from the match rating on each alternative to each criterion. Data on alternative values carried out by the assessment conversion process on the Kelor Island are presented in Table 2.

Table 2. Alternative Data and Criteria for Kelor Island

Kelor Island					
Alternatives	**C1**	**C2**	**C3**	**C4**	**C5**
A1	5	5	3	5	4

A2	5	5	4	5	4
A3	5	4	4	4	2
A4	5	5	4	3	2
A5	4	4	4	5	3
A6	4	4	3	3	4
A7	5	5	4	3	2
A8	5	5	4	4	3
A9	5	4	4	5	2
A10	4	5	3	5	3
A11	5	5	3	3	2
A12	4	5	3	5	2
A13	4	5	4	5	3
A14	5	5	4	3	3
A15	5	4	3	3	3

For alternative data against the criteria on the island of Onrust is presented in Table 3.

Table 3. Alternative Data and Criteria for Onrust Island

Onrust Island					
Alternatives	**C1**	**C2**	**C3**	**C4**	**C5**
A1	5	5	3	5	4
A2	5	5	4	5	4
A3	5	4	4	4	2
A4	5	5	4	3	2
A5	4	4	4	5	3
A6	4	4	3	3	4
A7	5	5	4	3	2
A8	5	5	4	4	3
A9	5	4	4	5	2
A10	4	5	3	5	3
A11	5	5	3	3	2
A12	4	5	3	5	2
A13	4	5	4	5	3
A14	5	5	4	3	3
A15	5	4	3	3	3

Data on the results of the conversion of alternative assessments against each criterion for Cipir Island are presented in table 4.

Table 4. Alternative Data and Criteria for Cipir Island

Cipir Island					
Alternatives	**C1**	**C2**	**C3**	**C4**	**C5**
A1	5	5	3	5	4

A2	5	5	4	5	4
A3	5	4	4	4	2
A4	5	5	4	3	2
A5	4	4	4	5	3
A6	4	4	3	3	4
A7	5	5	4	3	2
A8	5	5	4	4	3
A9	5	4	4	5	2
A10	4	5	3	5	3
A11	5	5	3	3	2
A12	4	5	3	5	2
A13	4	5	4	5	3
A14	5	5	4	3	3
A15	5	4	3	3	3

3.4. Determination of Matrix Normalization

The SAW method recognizes two attributes, namely the benefit criterion and the price (cost) criterion. Normalization for the benefit attribute uses formula (1) and for cost attribute using formula (2).

$$r_{ij} = \frac{x_{ij}}{\text{Max } x_{ij}} \quad (1)$$

$$r_{ij} = \frac{\text{Min } x_{ij}}{x_{ij}} \quad (2)$$

The matrix normalization calculation on the benefit attribute view criterion is as follows:

$r_{1.1} = \frac{5}{5} = 1$ $r_{2.1} = \frac{5}{5} = 1$

The matrix normalization calculation on the benefit attribute photo spot criteria is as follows:

$r_{1.2} = \frac{5}{5} = 1$ $r_{2.2} = \frac{5}{5} = 1$

The matrix normalization calculation on the benefit attribute transport criteria is as follows:

$r_{1.3} = \frac{3}{4} = 0.75$ $r_{2.3} = \frac{4}{4} = 1$

The matrix normalization calculation on the toilet criteria is as follows:

$r_{1.4} = \frac{5}{5} = 1$ $r_{2.4} = \frac{5}{5} = 1$

The matrix normalization calculation on the criteria for resto attributes is as follows:

$r_{1.5} = \frac{4}{4} = 1$ $r_{2.5} = \frac{4}{4} = 1$

Table 5 presents data on the results of matrix normalization calculations for historical tourist destinations of Kelor Island, Onrust Island and Cipir Island.

Table 5. Normalization Data on Tourist Destinations

Kelor Island					
Alternatives	**C1**	**C2**	**C3**	**C4**	**C5**
A1	1	1	0.75	1	1
A2	1	1	1	1	1
A3	1	0.8	1	0.8	0.5

A4	1	1	1	0.6	0.5
A5	0.80	0.8	1	1	0.75
A6	0.80	0.8	0.75	0.6	1
A7	1	1	1	0.6	0.5
A8	1	1	1	0.8	0.75
A9	1	0.8	1	1	0.5
A10	0.80	1	0.75	1	0.75
A11	1	1	0.75	0.6	0.5
A12	0.80	1	0.75	1	0.5
A13	0.80	1	1	1	0.75
A14	1	1	1	0.6	0.75
A15	1	0.8	0.75	0.6	0.75

Onrust Island

Alternatives	C1	C2	C3	C4	C5
A1	1	0.8	0.75	0.6	0.75
A2	0.80	0.8	0.75	0.8	1
A3	0.80	0.8	1	0.6	0.5
A4	0.80	0.8	1	0.6	0.5
A5	1	0.8	1	0.8	0.75
A6	1	1	1	1	1
A7	0.80	0.8	0.75	1	0.5
A8	1	1	0.75	0.6	0.75
A9	0.80	0.8	0.75	0.6	0.5
A10	0.80	1	0.75	0.6	0.75
A11	0.80	0.8	0.75	0.6	0.5
A12	0.80	1	1	1	0.5
A13	1	1	1	1	0.75
A14	1	0.8	1	0.8	0.75
A15	0.80	1	1	0.6	0.5

Cipir Island

Alternatives	C1	C2	C3	C4	C5
A1	0.80	0.6	1	1	0.75
A2	1	0.8	1	0.5	0.75
A3	0.60	0.8	1	0.75	1
A4	1	0.8	1	0.75	1
A5	0.80	0.6	0.75	1	0.5
A6	1	1	0.75	0.75	0.5
A7	0.60	0.8	0.75	0.5	0.5
A8	1	0.6	0.75	1	0.5
A9	0.60	1	1	0.5	0.75
A10	0.60	0.6	0.75	0.75	1
A11	0.80	1	0.75	0.75	1
A12	0.80	0.8	0.75	0.5	1

A13	1	1	0.75	0.75	1
A14	0.60	1	1	0.75	0.75
A15	0.80	1	1	0.5	0.75

3.5. Preference Value Determination

Determining the preference value in the SAW method by summing the normalized matrix that has been multiplied by the weight of the criteria. The results of the preference value on the tourist destinations of Kelor, Onrust and Cipir Island which have the highest scores, are tourist recommendations resulting from the calculation of the SAW method.

$$Vi = \sum_{j=1}^{n} w_j \, r_{ij} \quad (3)$$

The preference value in the first data record for the Kelor island destination can be obtained from the following calculation results.

V1=(0.188×1)+(0.281×1)+(0.063×0.75)+(0.406×1)+(0.063×1) =0.83

The following is the calculation of the preference value in the first data record for the Onrust island destination.

V1=(0.188×1)+(0.281×0.8)+(0.063×0.75)+(0.406×0.6)+(0.063×0.75) =0.75

The determination of the preference value in the first data record for the Cipir island destination also uses equation (3) as follows

V1=(0.188×0.8)+(0.281×0.6)+(0.063×1)+(0.406×1)+(0.063×0.75) =0.83

Data on the value of preferences for tourist destinations in the *Kepulauan Seribu* historical attractions Kelor, Onrust and Cipir Island are shown in Table 6.

Table 6. Tourist Destination Preference Value

Preference Value		
Kelor	**Onrust**	**Cipir**
0.984	0.750	0.834
1	0.809	0.725
0.831	0.713	0.767
0.806	0.713	0.842
0.891	0.847	0.803
0.728	1	0.852
0.806	0.859	0.619
0.903	0.806	0.841
0.913	0.697	0.706
0.931	0.769	0.695
0.791	0.697	0.845
0.916	0.931	0.688
0.947	0.984	0.883
0.822	0.847	0.808
0.750	0.769	0.744

The resulting preference value is then carried out a comparison analysis, the comparison analysis is used to determine the highest value preference value among the existing alternatives. The results of the comparison of recommendations for selected tourist destinations that have the highest preference value. From the results of the comparative analysis, it shows that there are seven highest preference values on Kelor island destinations, six highest preference values on Onrust island and two highest preference values on Cipir Island. Figure 3 presents a graph related to the results of preference values resulting from the results of the SAW method decisions.

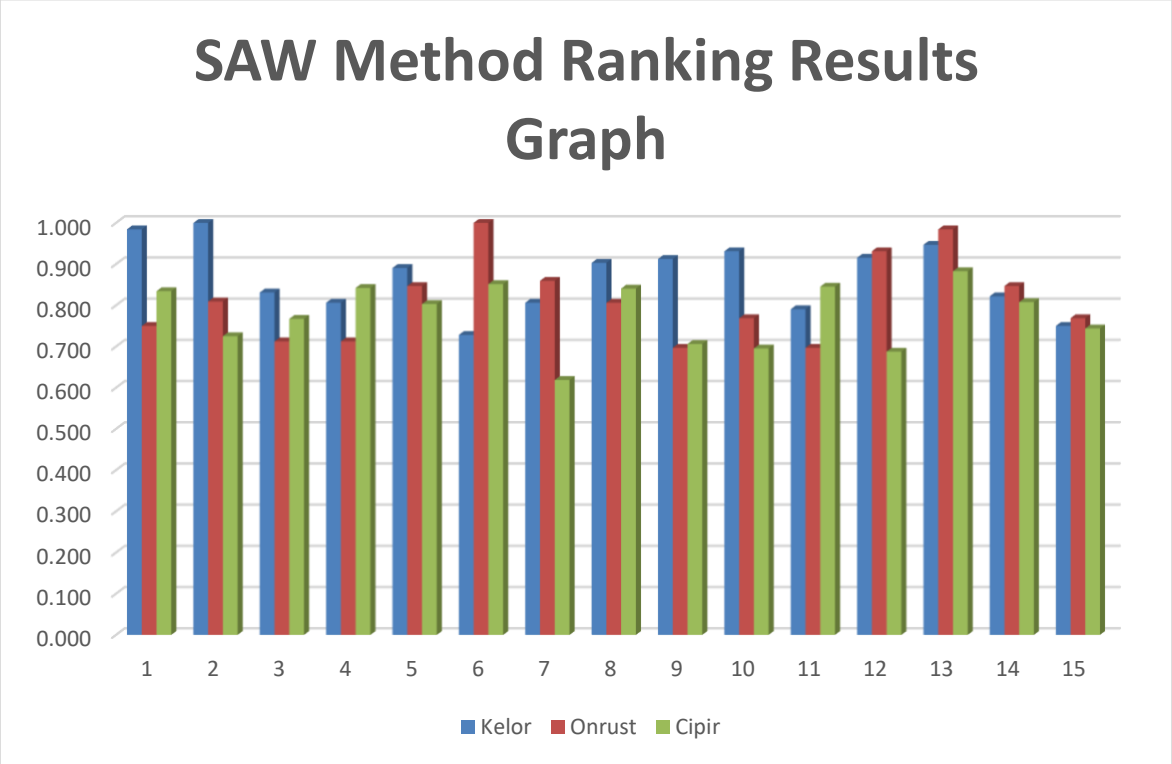

Figure 3. SAW Method Ranking Results Graph

The percentage of comparative analysis results obtained Moringa 47%, Onrust 40% and Cipir 13%. Thus, the results of the comparative analysis that has been carried out obtained by Kelor island become recommendations for tourist destinations chosen for historical attractions in the Kepulauan Seribu.

4. CONCLUSION

Some conclusions regarding the selection of tourist destinations in the *Kepulauan Seribu* for historical attractions include **a)** the SAW method can be implemented in determining recommendations for historical island tourist destinations in the *Kepulauan Seribu*; **b)** the process of determining tourist destinations the SAW method goes through several stages, namely determining criteria, determining weights, determining matrix normalization by taking into account the attributes of benefit or cost criteria and the final process of determining the value of preferences; **c)** there are five assessment criteria in determining tourist destinations by considering aspects of attractions, accessibility and amenities, namely scenery, photo spots, transportation, toilets and places to eat; **d)** determination of weights on criteria using a statistical approach from questionnaire results shared with the likert scale; **e)** the preferred value of tourism recommendations is Kelor Island, this is because there are seven highest values obtained by the island compared to Onrust Island and Cipir Island with a percentage value of 47%. Further research that can be done applies other decision support methods such as AHP, TOPSIS and WP which can then be compared with the results of the accuracy test of each method. Another research opportunity that can be done is to develop a software

application that can be utilized in determining destinations based on the value of preferences generated from a decision support method.

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