Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th October 2023. Vol. 3. No. 1; e-ISSN : 2808-4519

Application Of Vikor Method To Determine The Location Of Election And Election Care Villages

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Abstract

General elections are the core of the democratic process which involves active community participation. In order to realize optimal participation, it is necessary to make efforts to increase public awareness and participation in elections and elections. One effective way is to identify strategic locations to implement the "Village Care for Elections and Elections" program. This study aims to apply the VIKOR method (VlseKriterijumska Optimizacija I Kompromisno Resenje) in determining the optimal location for the program. The VIKOR method is used as an analytical tool in considering several relevant criteria, such as the level of previous participation, the level of political awareness, the accessibility of the location, and the level of local government support. These data are evaluated and analyzed to assign a ranking to each potential location. Application steps include data collection, normalization, calculating VIKOR scores, and determining ranking. The results of this research provide clear guidance in determining the most suitable location for the "Election and Election Care Village" program. The selected location is the result of a compromise that considers all relevant criteria. It is hoped that the results of this research can become a basis for local governments or related institutions to allocate resources more effectively in order to increase people's participation in the democratic process.

Keywords: *General Election, Community Participation, VIKOR Method, Election and Election Care Village.*

1. Introduction

General elections are people's parties in a democracy that are held to elect leaders in the region or at the center. This is carried out in the process of selecting people who fill political positions because these positions vary from the president, representatives of the people at various levels of government, and up to the village. The implementation of elections is said to be good if the participation of the community in each village/city is very high. The large number of participants will show that the level of public awareness about the importance of elections is good. However, there are still many people in the village who are not empathetic in the election. This is due to public distrust of the results of the process of conducting elections. In addition, people never feel any changes in conditions or better circumstances in everyday life.

Election and electoral care is the set of abilities that voters need to actively participate in elections or elections. The ability to care about elections and elections is needed as a prerequisite for ideal political participation, both during the period and outside the period of elections or elections. Good election care and electoral attitudes make voters know how to behave and actively participate in a political process. The concern of the community as citizens in the context of elections and elections will lead them to be active. The activeness is not only participating in the voting, but also active at all stages of elections and elections at various levels. This activity will form a strong pillar in the success of the election and further to the strengthening of democracy and regional development. The importance of encouraging active participation of the community in elections and elections is the background for the formation of election and election Care Villages. Where, the village is the social level of citizens from the smallest. If this small social level is able to be independent and rational (literate) in a political context, it is expected to have an impact on the larger social level. So that wider public participation in terms of elections and elections independently and rationally can be achieved.

A village is said to care about elections and elections are not only measured quantitatively, namely based on voter turnout in elections and elections at various levels but also qualitatively. Especially in making political choices, society consciously puts forward its independence and rationality. Society must be sovereign over its own political choices. That is, in choosing a potential leader in the process of elections and elections, people are not willing to be intervened by certain interests. People consciously dare to reject the existence of money politics, are able to filter information that smells of hoaxes and hate speech and avoid the politicization of SARA.(City et al., 2021)

Decision support system is used in determining the village care elections and elections to facilitate the user to determine which village decisions are appropriate in determining the village care elections and elections. The system can take a decision in accordance with the consideration of existing criteria in accordance with the criteria that have been determined in advance so that it can be selected the best to determine the best village.The ability of Decision Support Systems to help choose the best village to determine the village cares about elections and elections, the help of decision support systems can be felt more quickly and accurately if the decision system is in the form of a computer. The ability of computers to select data based on software that is inserted into the computer,to produce alternative decisions in choosing the best village. Visekriterijumsko Kompromisno Rangiranje (VIKOR) is a ranking method using a multicriteria ranking index based on a specific measure of proximity to the ideal solution. The basic concept of VIKOR is to determine the ranking of existing samples by looking at the results of the utility values and regrets of each sample. VIKOR method is used to solve the problem of multicriteria complex system that focuses on ranking and selection of an alternative. In addition this method has advantages in alternative compromise. (See also etal., 2018)

2. Research Method

2.1 Definition Of Decision

In everyday life we are inseparable from the decision-making process. The activities carried out today are inseparable from the decisions that have been made in the past.
According to (Haris, 2012) in a book written by (Kusumadewi et al., 2021) a decision (decision) is a reaction (alternative solution) taken taking into account several factors, and analyzing the consequences of the chosen solution. Decision making is the study of identifying and choosing the best alternatives based on the values and preferences of decision makers.

2.2 Understanding Of Decision Support Systems

There are several researchers who have given a definition of Decision Support System (SPK) or Decision Support System (DSS). According To (McLeod Jr., 1998) in a book written by (Kusumadewi et al., 2021) Decision Support System is a system that provides capabilities in problem solving and communication for problems that are semi-structured.

SPK is not just providing information, but more on providing the ability to solve the problems offered. For specific cases (such as Group purposes), the DSS must also provide the ability to facilitate communication. The problem Domain that is suitable to be solved by SPK is a semi-structured problem.
SPK is required to be a smart and reliable system to help solve problems. By adopting human intelligence, SPK has three main components that support such intelligence, namely:

1. System language (user interface). If analogized to humans, this is like the ability of humans to communicate with others including their appearance style. A person who is intelligent and acceptable in various circles certainly has excellent communication skills.
2. Knowledge system). If it is analogous to humans, it is like knowledge and experience possessed by humans. The more knowledge and experience a person has, the more intelligent he is (the more reliable in solving problems).
3. Problem processing. If it is analogous to humans, it is like knowledge and experience possessed by humans.

The three components do not stand alone, but are a single whole. A SPK that has a good user interface but a minimal knowledge base will certainly not be able to solve the problem properly. SPK with a complete knowledge base but made with a user interface that has low reusability (not user friendly) will also not be able to perform well. SPK with excellent user interface, complete knowledge base but not supported by reliable reasoning ability also will not be able to produce the best solution. (Kusumadewi et al., 2021)

SPK can be classified into five types, namely:

1. Model-driven Decision Support Systems access and manipulate statistical, financial, optimization, or simulation models. Model-driven DSS uses the given data and parameters to task decision makers in analyzing the situation. This type does not require intensive data.
2. This type of Data-driven Decision Support System will access and manipulate data over time. Data-driven DSS is data intensive.
3. This type of Communication-driven Decision Support system accommodates the support of several decision makers in sharing tasks. This type is very suitable for Group Decision Support Systems.
4. Document-driven Decision Support System this type of DSS will do the arrangement, retrieval, manipulate unstructured information in various electronic formats.
5. Knowledge-driven Decision Support System this type of SPK will perform the resolution of certain problems that are stored as facts, rules, procedures, or other similar structures. (Kusumadewi et al., 2021)

The purpose of Decision Support Systems is to provide data and information related to the achievement of these goals:

1. Software that supports decision makers in solving structured problems is needed.
2. To help decision makers identify those aspects of the problem that they cannot fully understand, this term is used.
3. Decision support systems are intended to assist a person in making decisions, not replace their decision-making process. This system helps people gather the information they need to make decisions (Gede Iwan Sudipa et al., 2023)

According To Herbert A. Simon, in a book written by (Gede Iwan Sudipa et al., 2023) decision-making process through six stages

1. The understanding stage (Inteligence Phace) of the investigation begins with identifying the problem and finding its scope. Once collected, the data is analyzed and tested for validity.
2. Design phase (Design Phace) to check the problem accurately, validation and verification process is required. This is why real-world events are broken down and studied during this particular stage.
3. Selection phase (Choice Phace) during the planning phase, various ideas for solving the problem are considered so that the best solution can be selected. This process is referred to as Phase 2 and is necessary to meet the project objectives.
4. Implementation phase in this phase the creator decides the alternative action to be selected at the selection stage.

Decision support systems provide benefits to decision makers, the following benefits:

1. SPK expands the ability of decision makers in processing data / information for the wearer.
2. SPK helps decision makers to solve problems, especially a variety of very complex and unstructured problems.
3. SPK can produce solutions more quickly and the results are reliable.

2.3 VIKOR method

According to (Nofriansyah et al., 2017) vise Kriterijumska Optimizacija I Kompromisno Resenje (VIKOR) method is one of the multi-criteria decision making methods or better known as Multi Criteria Decision Making (MCDM). MCDM is used to solve problems with conflicting and incompatible criteria. This method focuses on ranking and selecting from an alternative set of conflicting criteria for decision-making to reach a final decision.

This method takes a decision with a solution close to ideal and each alternative is evaluated based on all criteria that have been established. Vikor ranks alternatives and determines solutions that are close to the ideal compromise solution. The Vikor method is especially useful in situations where decision-making does not have the ability to make choices when the design of a system begins.
Calculation steps with VIKOR method as follows:

Perform Normalization Using The Formula

$$r_{ij} = \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-}\right) \quad (1)$$

Where Rij and Xij (i=1,2,3....,m and j= i=1,2,3....,n)
Is an element of the decision-making matrix.
x_j^+ is the best element of Criterion j
x_j^ - is the worst element of Criterion j

Calculating s and R values

After normalizing, then find the value of S and R with the following formula:

$$S_i = \sum_{j=1}^{n} W_j \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-}\right) \quad (2)$$

and

$$R_i = Max\ j \left[w_j \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-}\right)\right] \quad (3)$$

Where Wi is the weight of each criterion j

Determining The Index Value

The next step is to determine the index value using the following formula:

$$Q_i = \left[\frac{S_i - S^-}{S^+ - S^-}\right] V + \left[\frac{R_i - R^-}{R^+ - R^-}\right] (1 - V) \quad (4)$$

Where:
S - = min Si
S+ = max Si
R - = min Ri
R+ = max Ri
V = 0.5
The result of the ranking is the result of the management of S, R and Q.
Alternative Results Best Ranked By Minimun Q Value.

The advantages of the VIšekriterijumsko KOmpromisno Rangiranje (VIKOR) method include:

1. Comprehensive: it takes into account many criteria and provides a comprehensive evaluation of alternatives.
2. Compromise solution: it provides a compromise solution that balances the trade-off between the best and worst alternatives for each criterion.
3. Ranking: it provides a ranking of alternatives, which can be useful when there are many alternatives and the decision maker has to choose the best one.
4. Flexible: it can be used with quantitative and qualitative criteria and can be applied to different types of decision problems.

VIKOR's weaknesses include:

1. Complexity: this can be a complicated method to implement, especially when there are many criteria and alternatives.
2. Assumption: it is assumed that the decision maker is looking for a compromise solution, which may not always be the case.
3. Sensitivity: this can be sensitive to the choice of normalization method and weighting scheme used.
4. It is not always the most appropriate method: it is not always the most appropriate method when the decision maker has a clear preference for a particular alternative or when there are a large number of alternatives.

2.4 Definition Of Village

The village is an administrative division in Indonesia under the district. The village is the working area of the village head as a district or city device. The village is headed by a village head who has the status of a regency or City Regional device. The village is headed by a village head who has the status of a civil servant.

According To Government Regulation Of The Republic Of Indonesia No.73 of 2005 Article 1, Paragraph 5, Village as a District/City in the working area of the district. A village is the smallest unit of government. The village has the right to regulate its territory more limited.

3. Results And Discussion

Research methods are carried out to search for something systematically using scientific methods from applicable sources. In the process of this research is intended to further provide heavy results for the Binjai City Election Commission in determining the location of the village of election care and elections in Binjai city.The results of the conceptualization will be poured into a complete research method with a pattern of literature studies,data collection conducted to analyze the system that will be made is to determine the location of the village election care and elections using the VIKOR method.

On the basis of the research methodology used in the research in this study it can be made an activity of working methods as shown below.

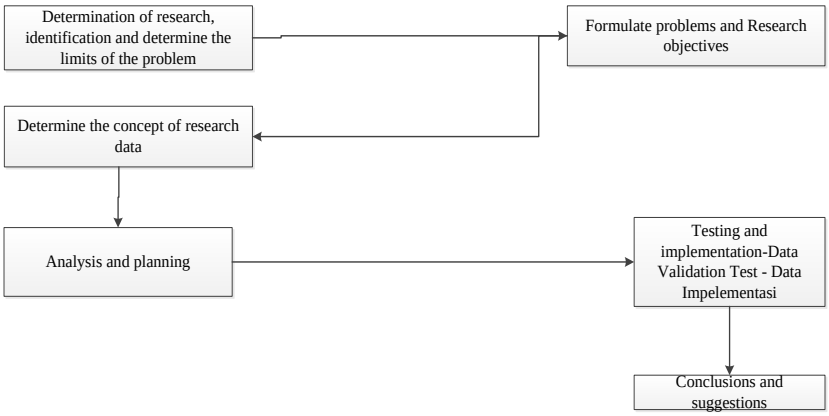

Figure 1: Research Methodology

1. Determining the place of research by identifying what problems are happening to the Binjai City General Election Commission to determine the village of election and election care and determine the limits of the problems carried out so that it can be continued to identify and determine the limits of the problems that exist in the place of research.
2. Formulate problems and research objectives, namely determining the formulation of the problem to be done what is the problem when conducting research at the Binjai City Election Commission, after getting the problem then made the research objectives of the formulation of the problem so that the research can be continued.
3. Determining the concept of research data, namely collecting data related to the title of research, namely village elections and election care, data obtained from Mr. Anugrah P.Telaumbanua in Binjai City Election Commission. Then conceptualize the data into data that is in accordance with the needs of research.
4. Litertur study and internet browsing, conducted to find learning materials that support research in accordance with the title. Starting from looking for books in the library, looking at reference journals, related theses to browsing the internet to complete the study of literature.
5. Research methodology to find the right method in conducting this research, ranging from literature studies, interviews conducted directly to the Binjai City Election Commission, and looking for supporting references obtained from the internet.
6. Identification and analysis, carried out to determine the software to be used. Identify by taking the data needed to get the steps or algorithms and ketia logic poured into a programming language that uses PHP programming language.7. Tester and implementation, after the software is finished being used and then tested and used by the use. This test is carried out to find out the feasibility of the system to be used whether there can still be deficiencies that must be completed so that the system is really feasible to use.
7. Conclusions and suggestions, after the completion of the research and the system being built is completed, conclusions and suggestions can be drawn that can be useful for anyone for further research development.

3.1 Application Of The Method

Application of the method is needed in solving a problem that is difficult to determine in the assessment process. In making a decision, of course, accurate data analyzes must be carried out in determining decision making. Many methods are used in making a decision that has been done by many researchers. In the study with the title mentukan Desa peduli pemilu and elections using the VIKOR method. The following is an analysis calculation process that has been done using the VIKOR method.

3.1.1 Analysis using VIKOR method

At this stage will discuss about data input and calculation process using VIKOR method.this process performs the selection according to the criteria that have been determined. The following are the steps to be performed in the calculation.

3.1.2 Alternative Data

The following is an alternative data that will be calculated using the VIKOR method to determine the village concerned with elections and elections. The data criteria are as follows.

Table 1: Data on Criteria for Villages Care about elections and elections

Alternative	Village/ Ward
Alternative 1	Land Red
Alternative 2	Estate Binjai
Alternative 3	Bhakti works
Alternative 4	Internal Hair
Alternative 5	Pujidadi
Alternative 6	Land of a Thousand
Alternative 7	West Rambung
Alternative 8	Eastern Hair
Alternative 9	Sinembah City
Alternative 10	Lime Mungkur

Table 2: Criteria data

Criteria	Information	Weight
C1	Potential Violations	0.35
C2	Participation	0.40
C3	TPS location	0.25

Table 3: Alternative Data

Alternative	Village/ Ward	C1	C2	C3
Alternative 1	Land Red	85%	80%	6,2 KM
Alternative 2	Estate Binjai	80%	95%	2,7 KM
Alternative 3	Bhakti works	60%	90%	7,2 KM
Alternative 4	Internal Hair	80%	80%	2,7 KM
Alternative 5	Pujidadi	55%	80%	4,5 KM
Alternative 6	Land of a Thousand	58%	85%	6,7 KM
Alternative 7	West Rambung	88%	60%	2,0 KM
Alternative 8	Eastern Hair	55%	90%	1,7 KM
Alternative 9	Sinembah City	83%	40%	3,9 KM
Alternative 10	Lime Mungkur	79%	60%	900 M

The next step is the completion process using the Vikor method as follows:

1) Perform normalization using a formula

$$r_{ij} = \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-}\right)$$

Where Rij and Xij (i=1,2,3....,m and j= i=1,2,3....,n)
Is an element of the decision-making matrix.
x_j^+ is the best element of criterion j
x_j^- is the worst element of criterion j

Table 4: Decision Matrix

Alternative	Village/ Ward	C1	C2	C3
Alternative 1	Land Red	0.85	0.80	6200
Alternative 2	Estate Binjai	0.80	0.95	2700
Alternative 3	Bhakti works	0.60	0.90	7200
Alternative 4	Internal Hair	0.80	0.80	2700
Alternative 5	Pujidadi	0.55	0.80	4500
Alternative 6	Land of a Thousand	0.58	0.85	6700
Alternative 7	West Rambung	0.88	0.60	2000
Alternative 8	Eastern Hair	0.55	0.90	1700
Alternative 9	Sinembah City	0.83	0.40	3900
Alternative 10	Lime Mungkur	0.79	0.60	900

$$r_{11} = \frac{0.88 - 0.85}{0.88 - 0.55} = \frac{0.03}{0.33} = 0.09$$

$$r_{12} = \frac{0.88 - 0.80}{0.88 - 0.55} = \frac{0.08}{0.33} = 0.24$$

$$r_{13} = \frac{0.88 - 0.60}{0.88 - 0.55} = \frac{0.28}{0.33} = 0.84$$

$$r_{14} = \frac{0.88 - 0.80}{0.88 - 0.55} = \frac{0.08}{0.33} = 0.24$$

$$r_{15} = \frac{0.88 - 0.55}{0.88 - 0.55} = \frac{0.33}{0.33} = 1$$
$$r_{16} = \frac{0.88 - 0.58}{0.88 - 0.55} = \frac{0.30}{0.33} = 0.90$$
$$r_{17} = \frac{0.88 - 0.88}{0.88 - 0.55} = \frac{0}{0.33} = 0$$
$$r_{18} = \frac{0.88 - 0.55}{0.88 - 0.55} = \frac{0.33}{0.33} = 1$$
$$r_{19} = \frac{0.88 - 0.83}{0.88 - 0.55} = \frac{0.05}{0.33} = 0.15$$
$$r_{110} = \frac{0.88 - 0.79}{0.88 - 0.55} = \frac{0.09}{0.33} = 0.27$$

$$r_{21} = \frac{0.95 - 0.80}{0.95 - 0.40} = \frac{0.15}{0.55} = 0.27$$
$$r_{22} = \frac{0.95 - 0.95}{0.95 - 0.40} = \frac{0}{0.55} = 0$$
$$r_{23} = \frac{0.95 - 0.90}{0.95 - 0.40} = \frac{0.05}{0.55} = 0.09$$
$$r_{24} = \frac{0.95 - 0.80}{0.95 - 0.40} = \frac{0.15}{0.55} = 0.27$$
$$r_{25} = \frac{0.95 - 0.80}{0.95 - 0.40} = \frac{0.15}{0.55} = 0.27$$
$$r_{26} = \frac{0.95 - 0.85}{0.95 - 0.40} = \frac{0.1}{0.55} = 0.18$$
$$r_{27} = \frac{0.95 - 0.60}{0.95 - 0.40} = \frac{0.35}{0.55} = 0.63$$
$$r_{28} = \frac{0.95 - 0.90}{0.95 - 0.40} = \frac{0.05}{0.55} = 0.09$$
$$r_{29} = \frac{0.95 - 0.40}{0.95 - 0.40} = \frac{0.55}{0.55} = 1$$
$$r_{210} = \frac{0.95 - 0.60}{0.95 - 0.40} = \frac{0.35}{0.55} = 0.63$$

$$r_{31} = \frac{7200 - 6200}{7200 - 900} = \frac{1000}{6300} = 0.15$$
$$r_{32} = \frac{7200 - 2700}{7200 - 900} = \frac{4500}{6300} = 0.71$$
$$r_{33} = \frac{7200 - 7200}{7200 - 900} = \frac{0}{6300} = 0$$
$$r_{34} = \frac{7200 - 2700}{7200 - 900} = \frac{4500}{6300} = 0.71$$
$$r_{35} = \frac{7200 - 4500}{7200 - 900} = \frac{2700}{6300} = 0.42$$
$$r_{36} = \frac{7200 - 6700}{7200 - 900} = \frac{500}{6300} = 0.07$$
$$r_{37} = \frac{7200 - 2000}{7200 - 900} = \frac{5200}{6300} = 0.82$$
$$r_{38} = \frac{7200 - 1700}{7200 - 900} = \frac{5500}{6300} = 0.87$$
$$r_{39} = \frac{7200 - 3900}{7200 - 900} = \frac{3300}{6300} = 0.52$$
$$r_{310} = \frac{7200 - 900}{7200 - 900} = \frac{6300}{6300} = 1$$

Table 5: Normalization Results

Alternative	Village/ Ward	C1	C2	C3
Alternative 1	Land Red	0.09	0.27	0.15
Alternative 2	Estate Binjai	0.24	0	0.71
Alternative 3	Bhakti works	0.84	0.09	0
Alternative 4	Internal Hair	0.24	0.27	0.71
Alternative 5	Pujidadi	1	0.27	0.42
Alternative 6	Land of a Thousand	0.9	0.18	0.07
Alternative 7	West Rambung	0	0.63	0.82
Alternative 8	Eastern Hair	1	0.09	0.87
Alternative 9	Sinembah City	0.15	1	0.52
Alternative 10	Lime Mungkur	0.27	0.63	1

1) Calculating S and R Values

After normalization, then look for the S and R values using the following formula:

$S_i = \sum_{j=1}^{n} W_j \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-}\right)$ dan

$R_i = \text{Max j} \left[w_j \left(\frac{x_j^+ - x_{ij}}{x_j^+ - x_j^-}\right)\right]$

Where Wi is the weight of each criterion j

a. Determine the value of R as follows:

$R_{ij} * W_j =$

c11 = 0.09 * 0.35 = 0.031
c12 = 0.24 * 0.35 = 0.084
c13 = 0.84 * 0.35 = 0.294
c14 = 0.24 * 0.35 = 0.084
c15 = 1 * 0.35 = 0.350
c16 = 0.90 * 0.35 = 0.315
c17 = 0 * 0.35 = 0
c18 = 1 * 0.35 = 0.350
c19 = 0.15 * 0.35 = 0.052
c110 = 0.27 * 0.35 = 0.094

c21 = 0.27 * 0.40 = 0.108
c22 = 0 * 0.40 = 0
c23 = 0.09 * 0.40 = 0.036
c24 = 0.27 * 0.40 = 0.108
c25 = 0.27 * 0.40 = 0.108
c26 = 0.18 * 0.40 = 0.072
c27 = 0.63 * 0.40 = 0.252
c28 = 0.09 * 0.40 = 0.036
c29 = 1 * 0.40 = 0.40
c210 = 0.63 * 0.40 = 0.252

c31 = 0.15 * 0.25 = 0.037
c32 = 0.71 * 0.25 = 0.177
c33 = 0 * 0.25 = 0
c34 = 0.71 * 0.25 = 0.117
c35 = 0.42 * 0.25 = 0.105
c36 = 0.07 * 0.25 = 0.017
c37 = 0.82 * 0.25 = 0.205
c38 = 0.87 * 0.25 = 0.217
c39 = 0.52 * 0.25 = 0.130
c310 = 1 * 0.25 = 0.250

$$R_{ij} * W_j = \left|\begin{array}{ccc|c} 0.031 & 0.180 & 0.037 & 0.180 \\ 0.084 & 0 & 0.177 & 0.177 \\ 0.294 & 0.036 & 0 & 0.294 \\ 0.084 & 0108 & 0.177 & 0.177 \\ 0.350 & 0.108 & 0.105 & 0.350 \\ 0.315 & 0.072 & 0.017 & 0.315 \\ 0 & 0.252 & 0.205 & 0.252 \\ 0.350 & 0.036 & 0.217 & 0.350 \\ 0.052 & 0.40 & 0.130 & 0.130 \\ 0.094 & 0.252 & 0.250 & 0.252 \end{array}\right|$$

b. Determining S Value

S1 = 0.031 + 0.108 + 0.037 = 0.176
S2 = 0.084 + 0 + 0.177 = 0.261
S3 = 0.294 + 0.036 + 0 = 0.330
S4 = 0.084 + 0.108 + 0.177 = 0.369
S5 = 0.350 + 0.108+ 0.105 = 0.563
S6 = 0.315 + 0.072 + 0.017 = 0.404
S7 = 0 + 0.252 + 0.205 = 0.457
S8 = 0.350 + 0.036 + 0.217 = 0.603
S9 = 0.052 + 0.40 + 0.130 = 0.582
S10 = 0.094 + 0.252 + 0.250 = 0.596
S^+ = 0.603
S^- = 0.176
R^+ = 0.35
R^- = 0.037

2) Determine the Index Value

The next step is to determine the index value using the following formula:

$$Q_i = \left[\frac{S_i - S^-}{S^+ - S^-}\right] V + \left[\frac{R_i - R^-}{R^+ - R^-}\right] (1 - V)$$

Where:

S^- = min S_i

S^+ = max S_i

R^- = min R_i

R^+ = max R_i

V = 0,5

$$Q_1 = \left[\frac{0.176 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.108 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_1 = \left[\frac{0}{0.427}\right] * 0.5 + \left[\frac{0.071}{0.313}\right] * (1 - 0.5)$$
$$Q_1 = (0 * 0.5) + (0.226 * (1 - 0.5))$$
$$Q_1 = (0 * 0.5) + (0.226 * 0.5)$$
$$Q_1 = 0 + 0.113$$
$$Q_1 = 0.113$$

$$Q_2 = \left[\frac{0.261 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.177 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_2 = \left[\frac{0.085}{0.427}\right] * 0.5 + \left[\frac{0.140}{0.313}\right] * (1 - 0.5)$$
$$Q_2 = (0.199 * 0.5) + (0.447 * (1 - 0.5))$$
$$Q_2 = (0.199 * 0.5) + (0.447 * 0.5)$$
$$Q_2 = 0.099 + 0.223$$
$$Q_2 = 0.322$$

$$Q_3 = \left[\frac{0.330 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.294 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_3 = \left[\frac{0.154}{0.427}\right] * 0.5 + \left[\frac{0.257}{0.313}\right] * (1 - 0.5)$$
$$Q_3 = (0.360 * 0.5) + (0.821 * (1 - 0.5))$$
$$Q_3 = (0.360 * 0.5) + (0.821 * 0.5)$$
$$Q_3 = 0.180 + 0.410$$
$$Q_3 = 0.590$$

$$Q_4 = \left[\frac{0.369 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.177 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_4 = \left[\frac{0.193}{0.427}\right] * 0.5 + \left[\frac{0.140}{0.313}\right] * (1 - 0.5)$$
$$Q_4 = (0.451 * 0.5) + (0.447 * (1 - 0.5))$$
$$Q_4 = (0.451 * 0.5) + (0.447 * 0.5)$$
$$Q_4 = 0.225 + 0.223$$
$$Q_4 = 0.448$$

$$Q_5 = \left[\frac{0.563 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.350 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_5 = \left[\frac{0.387}{0.427}\right] * 0.5 + \left[\frac{0.313}{0.313}\right] * (1 - 0.5)$$
$$Q_5 = (0.906 * 0.5) + (1 * (1 - 0.5))$$
$$Q_5 = (0.906 * 0.5) + (1 * 0.5)$$
$$Q_5 = 0.453 + 0.5$$
$$Q_5 = 0.953$$

$$Q_6 = \left[\frac{0.404 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.315 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_6 = \left[\frac{0.228}{0.427}\right] * 0.5 + \left[\frac{0.278}{0.313}\right] * (1 - 0.5)$$
$$Q_6 = (0.533 * 0.5) + (0.888 * (1 - 0.5))$$
$$Q_6 = (0.533 * 0.5) + (0.888 * 0.5)$$
$$Q_6 = 0.266 + 0.444$$
$$Q_6 = 0.710$$

$$Q_7 = \left[\frac{0.557 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.252 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_7 = \left[\frac{0.281}{0.427}\right] * 0.5 + \left[\frac{0.215}{0.313}\right] * (1 - 0.5)$$
$$Q_7 = (0.658 * 0.5) + (0.686 * (1 - 0.5))$$
$$Q_7 = (0.658 * 0.5) + (0.686 * 0.5)$$
$$Q_7 = 0.329 + 0.343$$
$$Q_7 = 0.672$$

$$Q_8 = \left[\frac{0.350 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.603 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_8 = \left[\frac{0.427}{0.427}\right] * 0.5 + \left[\frac{0.313}{0.313}\right] * (1 - 0.5)$$
$$Q_8 = (1 * 0.5) + (1 * (1 - 0.5))$$
$$Q_8 = (1 * 0.5) + (1 * 0.5)$$
$$Q_8 = 0.5 + 0.5$$
$$Q_8 = 1$$

$$Q_2 = \left[\frac{0.582 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.130 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_9 = \left[\frac{0.406}{0.427}\right] * 0.5 + \left[\frac{0.093}{0.313}\right] * (1 - 0.5)$$
$$Q_9 = (0.950 * 0.5) + (0.297 * (1 - 0.5))$$
$$Q_9 = (0.950 * 0.5) + (0.297 * 0.5)$$
$$Q_9 = 0.475 + 0.148$$
$$Q_9 = 0.623$$

$$Q_{10} = \left[\frac{0.596 - 0.176}{0.603 - 0.176}\right] * 0.5 + \left[\frac{0.252 - 0.037}{0.350 - 0.037}\right] * (1 - 0.5)$$
$$Q_{10} = \left[\frac{0.420}{0.427}\right] * 0.5 + \left[\frac{0.215}{0.313}\right] * (1 - 0.5)$$
$$Q_{10} = (0.983 * 0.5) + (0.686 * (1 - 0.5))$$
$$Q_{10} = (0.983 * 0.5) + (0.686 * 0.5)$$
$$Q_{10} = 0.491 + 0.343$$
$$Q_{10} = 0.834$$

3) The ranking results are the results of managing S, R and Q
The following are the results obtained from Management of S, R and Q which can be seen in table 6

Table 6: Results of Qi Values

No.	Alternative	Village/ Ward	Qi value
1	Alternative 1	Land Red	0.113
2	Alternative 2	Estate Binjai	0.322
3	Alternative 3	Bhakti works	0.59
4	Alternative 4	Internal Hair	0.448
5	Alternative 5	Pujidadi	0.953
6	Alternative 6	Land of a Thousand	0.71
7	Alternative 7	West Rambung	0.672
8	Alternative 8	Eastern Hair	1
9	Alternative 9	Sinembah City	0.623
10	Alternative 10	Lime Mungkur	0.834

1) Best Ranking Alternative Results Based on Minimum Q Value
The following are the results of the best ranking based on the minimum Q value which can be seen in table 7

Table 7: Ranking Results

Alternative	Village/ Ward	Qi value	Rank
Alternative 8	Eastern Hair	1	1
Alternative 5	Pujidadi	0.953	2
Alternative 10	Lime Mungkur	0.834	3
Alternative 6	Land of a Thousand	0.71	4
Alternative 7	West Rambung	0.672	5
Alternative 9	Sinembah City	0.623	6
Alternative 3	Bhakti works	0.59	7
Alternative 4	Internal Hair	0.448	8
Alternative 2	Estate Binjai	0.322	9
Alternative 1	Land Red	0.113	10

From the results of research conducted from 10 data samples taken to be tested based on the criteria and sub-criteria taken, the results of the village care election test results obtained with the highest score, namely Alternative 8 (Ramung Timur) with the Qi value obtained, which is 1 or 100%.

4. Conclusion

From the results of research conducted from 10 data samples taken to be tested based on the criteria and sub-criteria taken, the results of the village care election test results obtained with the highest score, namely Alternative 8 (Eastern Hair) with the Qi value obtained, which is 1 or 100%.

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