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# Application of the AHP-ELECTRE Method for Selection OOP Based Apps Programs

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Abstract: Object-based programming (OOP) has become a trend among programming language users, this is because many functions, procedures and techniques for using features are so widely available. By utilizing the advantages of these facilities, it is possible to provide convenience for programmers who use object-based programming languages. The purpose of this study is to provide an objective scoring system for a number of programming applications that have been made equipped with the assessment criteria. Assessment criteria that can be used for object-based apps programs with eleven criteria, namely Class structure, Inheritance, Encapsulation, Pollymorphys, Constructur, Accessor, Mutator, Visibility, Overriding, Overloading, and Price. With these many criteria, it provides a level of difficulty in choosing an object-based program application. To determine the appropriateness of an apps program, source testing will be carried out in the form of coding that has been previously constructed which affects the eleven predetermined measurement criteria. The assessment process recommends using the Electre method as a measure of the results of the calculation and ranking process. While determining the weight of the criteria using the Analytic Hierarchy Process (AHP) method. From the results of the assessment of 23 object-based apps programs, ranking assessments are based on aggregate dominant matrices as follows, the first rank with a weight of 22 as the largest weight is owned by 4 apps programss, namely AP16, AP17, AP18, and AP19. Based on the results of the ranking process, it can be said that the ELECTRE and AHP methods can be used as a selection process for object-based apps programs with optimal results.

**Keywords:** AHP, OOP Base Apps, ELECTRE, Ranking, Selections.

## INTRODUCTION

Object-based programming has many advantages that are useful for programmers in making object-based coding, one of which is being able to build a framework that provides many techniques for using objects, even if they have been divided according to their respective functions and there is no need to create a new program listing (Rais, 2019). because with the development of coding such as the concept of inheritance that is able to develop coding from an existing base. In terms of security, there is also such a thing as encapsulation, where coding can be wrapped in a single unit that creates security from a number of hidden coding, provides a clear modular structure for a program so that it is very easy to define abstract data types with implementation details can be hidden, it can even make it easier maintain and modify the code that is already available (Ilham, 2020).

With this context, many programmers create apps programs that are used for the benefit of the internet of things and other uses such as business-oriented and perhaps science-oriented. The apps programs that is made is of course priced at a price that is in accordance with the intended use of the program from the client user. The higher the level of difficulty, the more expensive the price offered. This means that the quality is directly proportional to the price of the apps programs offered. Thus how to choose an apps programs that suits the price that is priced.

There are several methods that will be used to measure the suitability of an apps programs at a price that is directly proportional to the price. Of course, by knowing a number of assessment criteria for an apps programs, in the preamble of writing this research article, it has been stated that there are eleven criteria that can be used to measure object-based apps programss, namely Class structure, Inheritance, Encapsulation, Pollymorphys, Constructor, Accessor, Mutator (Rais, 2019), Visibility, Overriding, Overloading, and Price. With the explanation of these criteria, it is important to note that there are criteria that have meanings as high is the best (HB) and low is the best (LB). Hight is the best value will be normalized according to equation (5), while low is the best will use equation (6). This means that both will know where the position of an alternative is in the dataset environment.

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By using the Electre method, the product is an apps programs that is able to reduce the value of each variable compared to the alternatives of each criterion (Mary & Suganya, 2016). Before the elimination stage is carried out, each alternative must be normalized first based on each criterion weight based on the calculation of the Analytic Hierarchy Process (AHP) method (Wang, 2019). The AHP method used is based on Multi-criteria Decision Making (MCDM) (Akmaludin et al., 2020), where the calculation process uses the concept of iteration (iteration) to find the optimal eigenvector value (Saaty, 2003). To complete the truth of this AHP, an Expert Choice application can be used to prove the truth of the eigenvector results (Saaty, 2003)compared with calculations using the concept of algebraic matrices (Al-Harbi, 2001), (Ishizaka & Labib, 2009). The occurrence of an iteration process describes the depreciation value of differences of opinion in the assessment of the criteria to find the optimal eigenvector value (Ahmad et al., 2020).

## LITERATURE REVIEW

### Analytic Hierarchy Process (AHP)

The ability of the results obtained from an AHP to provide optimal and measurable decision support quantitative and qualitative decisions (Chybowski et al., 2016). This optimal decision can be proven by the results obtained from an eigenvector (Farkas, 2007) with instrumentation support in the form of a questionnaire which is converted into a scale shown in Fig. 1, where data collection techniques can be carried out in various ways, which in essence is that the data entry entered is objective. Although the appraiser is less objective, it can still be processed in its calculations using two-dimensional matrices. The benchmark of the matrices calculation process is seen in the resulting eigenvector value (Saaty, 2010). If there is still a difference in the results, it must be recalculated with the concept of multiplying two-dimensional matrices. The normalization of each multiplication matrix will be tested for correctness using the consistency ratio (CR) value according to equation (4). Before obtaining CR, you must measure the length of the vector called max as the solution length for the consistency index (CI) by following equation (3), thus the determination of the CI value will be supported by the Random Index (RI) (Alonso & Lamata, 2006) which is realized by Table the suitability of the order of matrices and can be seen in Table 1.

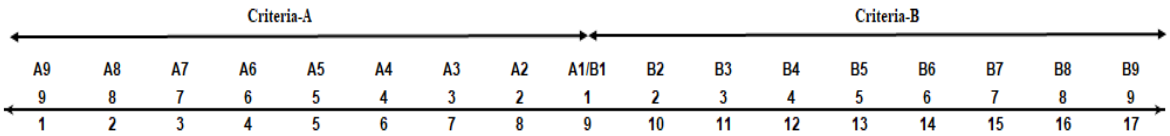


Fig 1. AHP conversion scale

Determination of a pairwise matrix is a sensitive matter, where the input value of each element of the matrix must be in the correct position which is adjusted to the value of the comparison made against the criteria being compared (Gupta & Tripathi, 2015). This is very important because it will give results that are always close to the optimal point of an eigenvector that is ready to be used for calculating algebra matrices. The correct arrangement by following equation (1) which is adjusted to the comparison questionnaire against the criteria.

$$M_{(b,k)} = \begin{bmatrix} a_{(1,1)} & a_{(1,2)} & a_{(1,3)} & \cdots & a_{(1,k)} \\ a_{(2,1)} & a_{(2,2)} & a_{(2,3)} & \cdots & a_{(2,k)} \\ a_{(3.1)} & a_{(3,2)} & a_{(2,4)} & \cdots & a_{(3,k)} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{(b,1)} & a_{(b,2)} & a_{(b,3)} & \cdots & a_{(b,k)} \end{bmatrix} \tag{1}$$

Meanwhile, to find out how many comparisons must be made, you can use equation (2), where the number of criteria will be compared with other criteria. This is to find out how many comparison values will be formed from a number of criteria that will be calculated. Because the data entry that is accumulated using the geometric mean method will be realized with the suitability of the matrix element items (Dave et al., 2012), (Pinem, 2017). For example, the number of criteria used is eleven criteria so that the number of comparisons that will be made using equation (2) is 55 comparisons. So that the total data elements that will be used to make a pairwise matrix are the same (Brunelli et al., 2013), namely 55 data elements matrices by following equation (2).

$$C = \frac{n*(n-1)}{2} \tag{2}$$

$$CI = \frac{(\lambda\ \mathrm{max} - \mathrm{n})}{(n-1)} \tag{3}$$

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$$CR = \frac{CI}{RI} \tag{4}$$

The number of orders will be seen from the row and column values (b, k) of the formed matrices, while the benchmark of the random index value for the 11 matrix elements becomes more important to determine how much RI value will be used, pay attention to Table 1.

Table 1. Random Index

| Ordo | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RI | 0.00 | 0.00 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.48 | 1.51 | 1.48 | 1.56 | 1.57 | 1.58 |

**ELECTRE**

Electre **(**Elimination Et Choix Traduisant la Realite) (Setiawan & Artanti, 2021) is a method that is used to conduct a sweeping elimination of a number of alternatives in each column of the criteria data being compared (Costa & Duarte, 2019). Of course, the data being compared must be normalized first, the criteria with the high value is the best will add value to the weight of the criteria for each alternative and the criteria with the low value is the best, as will reduce the weight value of the alternative. To determine the weight of an alternative hight is the best by using equation (5), while for giving the weight of the alternative to the criterion of low is the best value by using equation (6).

$$R_{(i,j)} = \frac{(X_{(i,j)} - X'_j)}{X^*_j - X'_j)} \tag{5}$$

$$R_{(i,j)} = \frac{(X_{(i,j)} - X^*_j)}{X'_j - X^*_j)} \tag{6}$$

The results of the normalization process will be eliminated by comparing each data element with other data elements totaling 23 rows which are used as comparison (Supriatin, S;Rahmi, AN;Asharudin, 2020). Thus, the large amount of data being compared is by using equation (7).

$$P = n * (n - 1) \tag{7}$$

So that the number of comparisons after normalization will be 506 data elements compared, this process is a determinant of the set along with the concordance weight and the set and discordance weight. The concordance set is an alternative that has a zero and positive value, while the discordance set is an alternative that has a negative value. For the concordace set, each weight is taken from all the concordance sets (Bathrinath et al., 2019). In contrast, the value for discordance is obtained based on the largest absolute negative value divided by the largest value of concordance. Each concordance value being compared is a preference index which will be compiled into a two-dimensional matrix as a concordance matrix, as well as the discordance value will form a two-dimensional matrix from a number of preference indexes to become a discordance matrix. To determine the set of concordance can use equation (8), while to determine the set of discordance can use equation (9).

$$C_{(k,l)} = \{J | V_{(k,j)} \geq V_{(i,j)}\} \; where \; j = 1,2,3, \ldots., n. \tag{8}$$

$$D_{(k,l)} = \{J | V_{(k,j)} < V_{(i,j)}\} \; where \; j = 1,2,3, \ldots., n. \tag{9}$$

By knowing the respective sets of concordance and discordance, from each row it will be possible to know the respective weight values owned by each concordance weight and the weight of each discordance. The method of obtaining each discordance weight can use equation (10) and to get the discordance weight gain using equation (11).

$$C_{(k,l)} = \sum_{jC_w} W_j \tag{10}$$

$$D_{(k,l)} = \frac{\{\max(V_{(m,n)} - V_{(m,n)-ln})\} \; where \; m,n \; \mathcal{E} \; D_{(k,l)}\}}{\{\max(V_{(m,n)} - V_{(m,n)-ln})\}, whree \; m,n = 1,2,3} \tag{11}$$

From each weighting to the row value of each concordance and discordance, according to the preference index, each will be placed at the position of each element of the matrices, thus obtaining the concordance and discordance matrices. To eliminate the two matrices, it must have a standard value called the threshold of each

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concordance and discordance matrices. To find the threshold matrices concordance can be done using equation (12), while to find the threshold gain from the discordance matrices using equation (13), where the value smaller than the threshold value will turn to zero.

$$\subseteq = \frac{\sum_{k=1}^{n}\sum_{l=1}^{n} c_{(k,l)}}{m*(m-n)} \tag{12}$$

$$\sqsupseteq = \frac{\sum_{k=1}^{n}\sum_{l=1}^{n} c_{(k,l)}}{m*(m-n)} \tag{13}$$

From the results obtained for the threshold concordance and threshold discordance, the final settlement step can use equation (14) to determine the overall final value that can be used as decision support with the help of aggregate dominant matrices, to determine the magnitude of the results of the aggregation of each alternative it bears. This means that the total weight of each alternative can be used as a ranking reference, the largest value of the weight is the highest priority in the ranking.

$$e_{(k,l)} = f_{(k,l)} x g_{(k,l)} \tag{14}$$

## METHOD

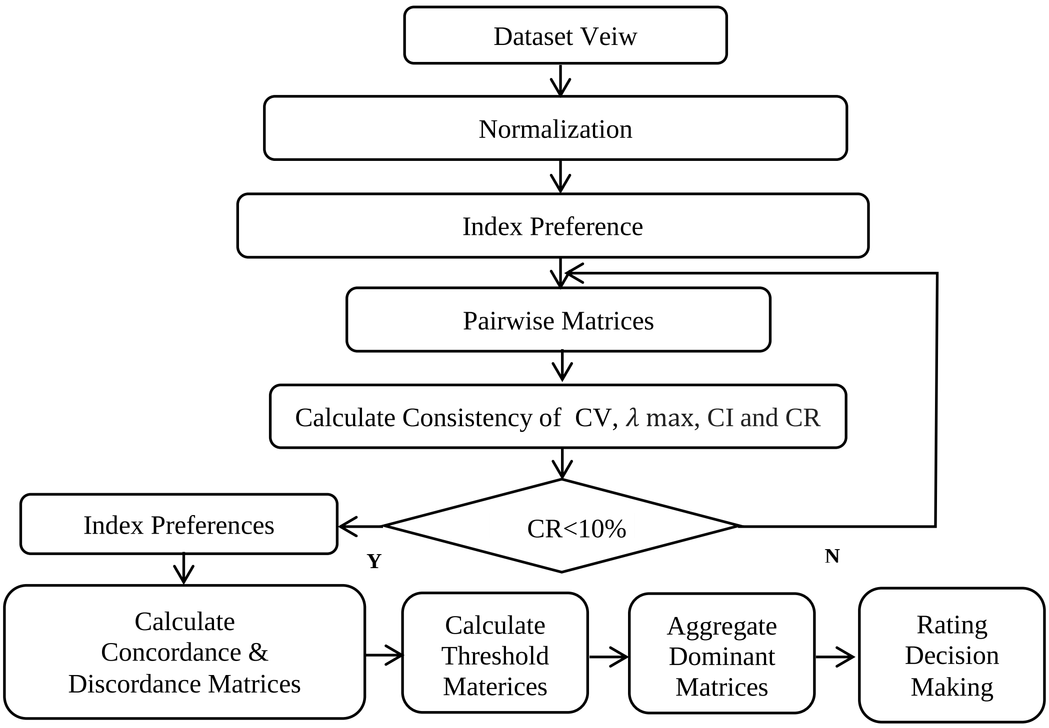


Fig. 2. AHP-ELECTRE Algoritm

## RESULT

Software is one of the most important parts in supporting the perfection of work, with the support of software, both structure-oriented and object-oriented, capable of supporting the work of each user, especially in terms of specific goals and general goals. Software is included in the category of apps programss created by programmers for certain functionalities. Object-based apps programss are still widely needed by users for certain purposes. Many programmers are able to create object-based apps programss (OOP) with adequate features and almost perfect in use. This object-based program application has many functions that can be used by a number of programmers to make coding easier, such as Class structure, Inheritance, Encapsulation, Pollymorhys, Constructor, Accessor, Mutator, Visibility, Overriding, Overloading, and Price which will be used as assessment criteria and results. of the apps programs that is made is given a price according to its function and use. The advantages of this object-based program can be developed functionally because there are many features that will

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support better results. With the many facilities in this object-based program, it is very difficult to give an assessment of the fair price, so the user really needs the right method to judge from a number of object-based apps programss. In this study, researchers will try to apply how to evaluate object-based apps programss correctly, because the work in the form of object-based apps programss has been given a price tag that is said to be appropriate. Therefore, what is a good and optimal application in selecting object-based apps programss.

In this study, we will discuss the application of selecting object-based apps programss using certain methods that are able to provide optimal results in the selection process for object-based apps programs. The method that will be used is the Analytic Hierarchy Process (AHP) which is used to determine the weight of each criterion to be used and the ELECTRE method which will be used to provide an elimination assessment of a number of alternatives that are selected for object-based apps programss..

Based on the data obtained that can be used as an observation table, it can be seen in Table 3 which is used as a reference in the assessment of a number of object-based apps programss that have been given values and prices for each apps programs criteria. Each criterion becomes a benchmark for the assessment consisting of eleven assessment criteria, these criteria can be seen in Table 2.

Table 2. List of Criteria Type

| Criteria | Code | Type |
|---|---|---|
| Class Structure | CS | HB |
| Inheritance | IH | HB |
| Encapsulation | EC | HB |
| Pollymorphys | PM | HB |
| Constructor | CO | HB |
| Accessor | AC | HB |
| Mutator | MT | HB |
| Visibility | VS | HB |
| Overriding | OR | LB |
| Overloading | OL | LB |
| Price | PC | LB |

Table 2 provides an overview of the criteria that will be used as an assessment tool for object-based apps programss. Each criterion has been given a type labeled Hight is the Best (HB) and Low is the Best (LB) this has a specific purpose towards the criteria. The HB criteria illustrates that the largest value is the best value, while LB provides an illustration that the smallest value is the best value. There are eight criteria labeled HB and three criteria labeled LB. This has a very big influence when the normalization process is carried out. The normalization process aims to provide an overview of the data where the location of a data element is in accordance with its range. The range of data will be measured based on the largest data and the smallest data from the data set. If the normalization results have been obtained, use equation (5) for criteria of type HB and equation (6) for criteria of type LB. Thus we will get data that has gone through the normalization process sourced from Table 5 of observational data into Table 6 which has been normalized.

While the determination of the magnitude of each criterion can be done with the concept of algebra matrices of eleven criteria processed by the AHP method, it can be seen in Table 3. The calculation process occurs five times iterations with the eigenvector reference there is no difference value and the result of the CR value is 0.07 this means it is acceptable, because the CR is less than 10 percent. The results will be used in the process of normalization and weighting with the ELECTRE method..

Table 3. Criteria of eigenvector

| Criteria | CS | IH | EC | PM | CO | AC | MT | VS | OR | OL | PC | Eigenvector |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class Structure (CS) | 1.000 | 2.000 | 2.000 | 2.000 | 2.000 | 3.000 | 3.000 | 3.000 | 3.000 | 2.000 | 2.000 | 0.174 |
| Inheritance (IH) | 0.500 | 1.000 | 2.000 | 2.000 | 2.000 | 2.000 | 3.000 | 3.000 | 3.000 | 2.000 | 2.000 | 0.147 |
| Encapsulation (EC) | 0.500 | 0.500 | 1.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 3.000 | 2.000 | 2.000 | 0.121 |
| Pollymorhys (PM) | 0.500 | 0.500 | 0.500 | 1.000 | 2.000 | 2.000 | 2.000 | 2.000 | 3.000 | 3.000 | 3.000 | 0.113 |
| Constructor (CO) | 0.500 | 0.500 | 0.500 | 0.500 | 1.000 | 2.000 | 2.000 | 2.000 | 3.000 | 3.000 | 2.000 | 0.097 |
| Accessor (AC) | 0.333 | 0.500 | 0.500 | 0.500 | 0.500 | 1.000 | 2.000 | 2.000 | 3.000 | 2.000 | 2.000 | 0.080 |
| Mutator (MT) | 0.333 | 0.333 | 0.500 | 0.500 | 0.500 | 0.500 | 1.000 | 3.000 | 2.000 | 2.000 | 3.000 | 0.072 |
| Visibility (VS) | 0.333 | 0.333 | 0.500 | 0.500 | 0.500 | 0.500 | 0.333 | 1.000 | 2.000 | 2.000 | 2.000 | 0.056 |
| Overriding (OR) | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.500 | 0.500 | 1.000 | 3.000 | 3.000 | 0.052 |
| Overloading (OL) | 0.500 | 0.500 | 0.500 | 0.333 | 0.333 | 0.500 | 0.500 | 0.500 | 0.333 | 1.000 | 3.000 | 0.048 |
| Price (PC) | 0.500 | 0.500 | 0.500 | 0.333 | 0.500 | 0.500 | 0.333 | 0.500 | 0.333 | 0.333 | 1.000 | 0.039 |
| ***The Result of*** **$\lambda$ *Max*=** | **12.020** | **;** ***CI*=** | **0.1** | **; *CR*=** | **0.07** | **; (Acceptable)** | | | | | | |

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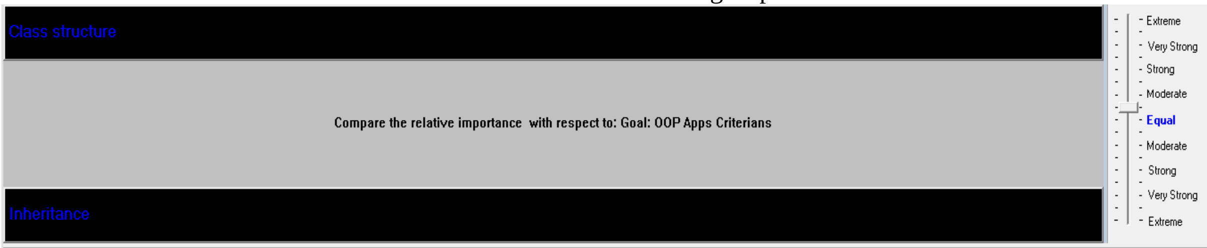
By using Expert choice, the eigenvector values have similarities in the positioning of the matrix elements, but only use the upper triangular matrices and for reciprocal data elements, they are not written, but have been done by the coding of program. Data entry element data matrices can be seen in Table 4.

Tabel 4. Elemen data matrices using Expert choice




| | Class structure | Inheritance | Encapsulat | Pollymorphys | Constructor | Accessor | Mutator | Visibility | Overriding | Overloading | Price |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Class structure | | 2.0 | 2.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 3.0 | 2.0 | 2.0 |
| Inheritance | | | 2.0 | 2.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 2.0 | 2.0 |
| Encapsulation | | | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 3.0 | 2.0 | 2.0 |
| Pollymorphys | | | | | 2.0 | 2.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 |
| Constructor | | | | | | 2.0 | 2.0 | 2.0 | 3.0 | 3.0 | 2.0 |
| Accessor | | | | | | | 2.0 | 2.0 | 3.0 | 2.0 | 2.0 |
| Mutator | | | | | | | | 3.0 | 2.0 | 2.0 | 3.0 |
| Visibility | | | | | | | | | 2.0 | 2.0 | 2.0 |
| Overriding | | | | | | | | | | 3.0 | 3.0 |
| Overloading | | | | | | | | | | | 3.0 |
| Price | Incon: 0.07 | | | | | | | | | | |

The magnitude of the eigenvector values of the eleven criteria is the result generated from the entry process for the data element matrices which can be compared with the results carried out through the algebra matrices process. The eigenvector gain with Expert choice can be seen in Fig. 3. The results of the eigenvector turned out to give the same results as the process of calculating algebra matrices. Thus, the eigenvector will be applied to the next stage with the ELECTRE method to determine the amount of concordance, discordance, until determine aggregate dominant matrices and ratings of alternatives starting from observation data.

By using Expert Choice the amount of consistency value can be displayed automatically, where the inconsistency value has a value of 0.07; This means that the inconsistency still has a good tolerance value. The discrepancy in the calculation process can still be tolerated, so that the support for the decision value is still acceptable, in contrast to using mathematical algebra matrices. Calculations with algebra matrices are not able to display the value of consistency, but to determine the feasibility of a decision based on the amount of Consistency ratio (CR) to determine the feasibility of the resulting eigenvector value.


Fig.3. Synthesize of Eigenvector using Expert choice

See on Table 5 is an observation table that will be tested using the Analytic Hierarchy Process and ELECTRE methods and must go through a normalization process for the placement of each data element with the size of the maximum and minimum data values.

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Table 5. Observation data

| Criteria (Alt) | CS (HB) | IH (HB) | EC (HB) | PM (HB) | CO (HB) | AC (HB) | MT (HB) | VS (HB) | OR (LB) | OL (LB) | PC (LB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AP01 | 79.01 | 74.46 | 78.02 | 75.85 | 76.03 | 85.00 | 74.43 | 74.15 | 43.69 | 37.67 | 50.13 |
| AP02 | 80.72 | 74.76 | 78.08 | 76.87 | 76.28 | 81.57 | 74.49 | 74.21 | 44.71 | 37.92 | 46.70 |
| AP03 | 91.12 | 81.95 | 77.82 | 72.09 | 64.98 | 82.16 | 74.22 | 73.95 | 39.93 | 26.62 | 47.29 |
| AP04 | 88.12 | 85.96 | 79.62 | 70.05 | 58.91 | 83.60 | 76.03 | 75.75 | 37.89 | 20.55 | 48.73 |
| AP05 | 90.07 | 76.64 | 77.2 | 77.65 | 76.91 | 79.54 | 73.60 | 73.33 | 45.49 | 38.55 | 44.67 |
| AP06 | 85.07 | 58.34 | 80.54 | 79.65 | 79.12 | 81.31 | 79.31 | 76.67 | 47.49 | 20.63 | 53.47 |
| AP07 | 76.56 | 73.19 | 61.95 | 77.17 | 64.21 | 84.19 | 79.00 | 78.7 | 45.51 | 25.85 | 49.32 |
| AP08 | 57.43 | 75.36 | 68.82 | 78.69 | 65.80 | 63.62 | 67.24 | 78.75 | 42.12 | 27.44 | 48.74 |
| AP09 | 89.12 | 77.34 | 68.58 | 77.30 | 57.03 | 78.65 | 77.26 | 76.97 | 43.49 | 18.67 | 43.78 |
| AP10 | 92.12 | 82.54 | 76.43 | 77.40 | 65.70 | 78.18 | 72.83 | 72.56 | 45.24 | 27.34 | 43.31 |
| AP11 | 83.23 | 73.21 | 79.28 | 79.13 | 64.36 | 79.16 | 75.69 | 75.41 | 46.97 | 26.00 | 44.29 |
| AP12 | 83.79 | 80.51 | 82.9 | 76.15 | 66.52 | 82.29 | 79.33 | 79.03 | 43.99 | 28.16 | 47.42 |
| AP13 | 87.13 | 77.87 | 83.43 | 76.24 | 66.18 | 77.78 | 79.86 | 79.56 | 44.08 | 27.82 | 42.91 |
| AP14 | 83.90 | 79.67 | 82.72 | 77.44 | 68.69 | 78.31 | 79.15 | 78.85 | 45.28 | 30.33 | 43.44 |
| AP15 | 81.67 | 71.26 | 77.44 | 77.54 | 65.95 | 78.49 | 73.84 | 73.57 | 45.38 | 27.59 | 43.62 |
| AP16 | 82.34 | 62.96 | 79.43 | 80.21 | 65.37 | 77.18 | 75.84 | 75.56 | 48.05 | 27.01 | 42.31 |
| AP17 | 74.54 | 67.61 | 75.44 | 73.19 | 61.95 | 77.17 | 88.53 | 71.57 | 41.03 | 23.59 | 42.30 |
| AP18 | 79.12 | 81.31 | 79.31 | 75.36 | 68.82 | 78.69 | 75.72 | 75.44 | 43.20 | 30.46 | 43.82 |
| AP19 | 84.09 | 81.57 | 82.91 | 77.34 | 68.58 | 77.30 | 79.34 | 79.04 | 45.18 | 30.22 | 42.43 |
| AP20 | 85.39 | 87.49 | 80.72 | 76.17 | 73.58 | 77.11 | 77.14 | 76.85 | 44.01 | 35.22 | 42.24 |
| AP21 | 84.83 | 69.37 | 81.8 | 81.35 | 77.70 | 76.34 | 78.22 | 77.93 | 49.19 | 39.34 | 41.47 |
| AP22 | 81.10 | 78.78 | 83.68 | 76.89 | 62.08 | 79.62 | 80.11 | 79.81 | 44.73 | 23.72 | 44.75 |
| AP23 | 81.78 | 79.03 | 84.42 | 72.72 | 69.92 | 80.51 | 80.85 | 80.55 | 40.56 | 31.56 | 45.64 |

Pay attention on Table 4 which is data that has gone through the normalization stage which consists of twenty-three alternatives and is ready for comparison as a data preference index. It can be clearly assumed that the number of alternatives to be compared is 506 data elements using equation (7). Where the same data is not included in the comparison calculation, so it is automatically worth one and is not taken into account in the calculation process. This is a form of exception to ELECTRE.

Table 6. Normalization

| **Criteria** | CS | IH | EC | PM | CO | AC | MT | VS | OR | OL | PC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (HB) | (HB) | (HB) | (HB) | (HB) | (HB) | (HB) | (HB) | (LB) | (LB) | (LB) |
| **(Alt)** | 0.174 | 0.147 | 0.121 | 0.113 | 0.097 | 0.080 | 0.072 | 0.056 | 0.052 | 0.048 | 0.039 |
| AP01 | 0.62 | 0.55 | 0.72 | 0.51 | 0.14 | 1.00 | 0.34 | 0.29 | 0.51 | 0.92 | 0.72 |
| AP02 | 0.67 | 0.56 | 0.72 | 0.60 | 0.13 | 0.84 | 0.34 | 0.29 | 0.60 | 0.93 | 0.44 |
| AP03 | 0.97 | 0.81 | 0.71 | 0.18 | 0.64 | 0.87 | 0.33 | 0.27 | 0.18 | 0.38 | 0.49 |
| AP04 | 0.88 | 0.95 | 0.79 | 0.00 | 0.91 | 0.93 | 0.41 | 0.47 | 0.00 | 0.09 | 0.61 |
| AP05 | 0.94 | 0.63 | 0.68 | 0.67 | 0.10 | 0.74 | 0.30 | 0.20 | 0.67 | 0.96 | 0.27 |
| AP06 | 0.80 | 0.00 | 0.83 | 0.85 | 0.00 | 0.83 | 0.57 | 0.57 | 0.85 | 0.09 | 1.00 |
| AP07 | 0.55 | 0.51 | 0.00 | 0.63 | 0.67 | 0.96 | 0.55 | 0.79 | 0.67 | 0.35 | 0.65 |
| AP08 | 0.00 | 0.58 | 0.31 | 0.76 | 0.60 | 0.00 | 0.00 | 0.80 | 0.37 | 0.42 | 0.61 |
| AP09 | 0.91 | 0.65 | 0.30 | 0.64 | 1.00 | 0.70 | 0.47 | 0.60 | 0.50 | 0.00 | 0.19 |
| AP10 | 1.00 | 0.83 | 0.64 | 0.65 | 0.61 | 0.68 | 0.26 | 0.11 | 0.65 | 0.42 | 0.15 |
| AP11 | 0.74 | 0.51 | 0.77 | 0.80 | 0.67 | 0.73 | 0.40 | 0.43 | 0.80 | 0.35 | 0.24 |
| AP12 | 0.76 | 0.76 | 0.93 | 0.54 | 0.57 | 0.87 | 0.57 | 0.83 | 0.54 | 0.46 | 0.50 |
| AP13 | 0.86 | 0.67 | 0.96 | 0.55 | 0.59 | 0.66 | 0.59 | 0.89 | 0.55 | 0.44 | 0.12 |
| AP14 | 0.76 | 0.73 | 0.92 | 0.65 | 0.47 | 0.69 | 0.56 | 0.81 | 0.65 | 0.56 | 0.16 |
| AP15 | 0.70 | 0.44 | 0.69 | 0.66 | 0.60 | 0.70 | 0.31 | 0.22 | 0.66 | 0.43 | 0.18 |
| AP16 | 0.72 | 0.16 | 0.78 | 0.90 | 0.62 | 0.63 | 0.40 | 0.44 | 0.90 | 0.40 | 0.07 |
| AP17 | 0.49 | 0.32 | 0.60 | 0.28 | 0.78 | 0.63 | 1.00 | 0.00 | 0.28 | 0.24 | 0.07 |
| AP18 | 0.63 | 0.79 | 0.77 | 0.47 | 0.47 | 0.70 | 0.40 | 0.43 | 0.47 | 0.57 | 0.20 |
| AP19 | 0.77 | 0.80 | 0.93 | 0.65 | 0.48 | 0.64 | 0.57 | 0.83 | 0.65 | 0.56 | 0.08 |
| AP20 | 0.81 | 1.00 | 0.84 | 0.54 | 0.25 | 0.63 | 0.46 | 0.59 | 0.54 | 0.80 | 0.06 |
| AP21 | 0.79 | 0.38 | 0.88 | 1.00 | 0.06 | 0.59 | 0.52 | 0.71 | 1.00 | 1.00 | 0.00 |
| AP22 | 0.68 | 0.70 | 0.97 | 0.61 | 0.77 | 0.75 | 0.60 | 0.92 | 0.61 | 0.24 | 0.27 |
| AP23 | 0.70 | 0.71 | 1.00 | 0.24 | 0.42 | 0.79 | 0.64 | 1.00 | 0.24 | 0.62 | 0.35 |

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The comparison results obtained can be arranged according to the location of the data being compared, so that the data will be arranged into the concordance matrix for the grouping using equation (8) as a reference for the concordance set and equation (10) as the calculation of the weight value of each element of the concordance matrix. The results of the arrangement of the concordace matrices can be seen in Table 7.

Table 7. Concordance Matrices

| Alt | AP01 | AP02 | AP03 | AP04 | AP05 | AP06 | AP07 | AP08 | AP09 | AP10 | AP11 | AP12 | AP13 | AP14 | AP15 | AP16 | AP17 | AP18 | AP19 | AP20 | AP21 | AP22 | AP23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP01 | | 0.22 | 0.58 | 0.33 | 0.47 | 0.37 | 0.61 | 0.59 | 0.34 | 0.42 | 0.32 | 0.17 | 0.17 | 0.17 | 0.56 | 0.32 | 0.83 | 0.33 | 0.17 | 0.17 | 0.36 | 0.17 | 0.33 |
| AP02 | 0.78 | | 0.46 | 0.21 | 0.47 | 0.37 | 0.49 | 0.55 | 0.34 | 0.42 | 0.32 | 0.21 | 0.33 | 0.17 | 0.56 | 0.32 | 0.83 | 0.51 | 0.17 | 0.33 | 0.36 | 0.17 | 0.33 |
| AP03 | 0.42 | 0.54 | | 0.39 | 0.79 | 0.55 | 0.49 | 0.69 | 0.61 | 0.47 | 0.49 | 0.42 | 0.54 | 0.54 | 0.79 | 0.54 | 0.67 | 0.54 | 0.54 | 0.39 | 0.54 | 0.49 | 0.54 |
| AP04 | 0.67 | 0.79 | 0.61 | | 0.61 | 0.50 | 0.54 | 0.69 | 0.44 | 0.61 | 0.79 | 0.54 | 0.54 | 0.54 | 0.79 | 0.79 | 0.71 | 0.79 | 0.54 | 0.39 | 0.54 | 0.54 | 0.54 |
| AP05 | 0.53 | 0.53 | 0.21 | 0.39 | | 0.47 | 0.60 | 0.69 | 0.63 | 0.58 | 0.49 | 0.39 | 0.51 | 0.51 | 0.65 | 0.49 | 0.83 | 0.51 | 0.51 | 0.51 | 0.54 | 0.39 | 0.39 |
| AP06 | 0.63 | 0.63 | 0.45 | 0.50 | 0.53 | | 0.57 | 0.65 | 0.53 | 0.53 | 0.71 | 0.38 | 0.28 | 0.53 | 0.71 | 0.54 | 0.63 | 0.71 | 0.46 | 0.36 | 0.37 | 0.46 | 0.46 |
| AP07 | 0.39 | 0.51 | 0.51 | 0.46 | 0.40 | 0.43 | | 0.51 | 0.35 | 0.40 | 0.34 | 0.38 | 0.38 | 0.27 | 0.54 | 0.49 | 0.71 | 0.51 | 0.27 | 0.51 | 0.49 | 0.33 | 0.38 |
| AP08 | 0.41 | 0.45 | 0.31 | 0.31 | 0.31 | 0.35 | 0.49 | | 0.47 | 0.35 | 0.39 | 0.15 | 0.15 | 0.15 | 0.36 | 0.39 | 0.55 | 0.00 | 0.15 | 0.21 | 0.24 | 0.30 | 0.20 |
| AP09 | 0.66 | 0.66 | 0.39 | 0.56 | 0.37 | 0.47 | 0.65 | 0.62 | | 0.34 | 0.55 | 0.38 | 0.50 | 0.39 | 0.67 | 0.67 | 0.76 | 0.56 | 0.39 | 0.63 | 0.54 | 0.38 | 0.44 |
| AP10 | 0.58 | 0.58 | 0.53 | 0.39 | 0.42 | 0.47 | 0.60 | 0.74 | 0.66 | | 0.37 | 0.58 | 0.70 | 0.42 | 0.42 | 0.49 | 0.83 | 0.58 | 0.70 | 0.56 | 0.54 | 0.53 | 0.58 |
| AP11 | 0.68 | 0.68 | 0.51 | 0.21 | 0.51 | 0.29 | 0.66 | 0.71 | 0.45 | 0.63 | | 0.26 | 0.38 | 0.38 | 0.95 | 0.54 | 0.83 | 0.56 | 0.38 | 0.38 | 0.36 | 0.39 | 0.44 |
| AP12 | 0.83 | 0.79 | 0.58 | 0.46 | 0.61 | 0.62 | 0.62 | 0.75 | 0.62 | 0.42 | 0.74 | | 0.32 | 0.61 | 0.74 | 0.74 | 0.83 | 0.80 | 0.22 | 0.47 | 0.61 | 0.49 | 0.70 |
| AP13 | 0.83 | 0.67 | 0.46 | 0.46 | 0.49 | 0.72 | 0.62 | 0.75 | 0.50 | 0.30 | 0.62 | 0.68 | | 0.52 | 0.57 | 0.66 | 0.79 | 0.74 | 0.67 | 0.69 | 0.75 | 0.74 | 0.23 |
| AP14 | 0.83 | 0.83 | 0.46 | 0.46 | 0.49 | 0.47 | 0.73 | 0.75 | 0.61 | 0.58 | 0.62 | 0.39 | 0.48 | | 0.62 | 0.74 | 0.83 | 0.68 | 0.33 | 0.63 | 0.61 | 0.53 | 0.58 |
| AP15 | 0.44 | 0.44 | 0.21 | 0.21 | 0.35 | 0.29 | 0.46 | 0.55 | 0.33 | 0.58 | 0.05 | 0.26 | 0.38 | 0.38 | | 0.32 | 0.83 | 0.44 | 0.38 | 0.38 | 0.36 | 0.39 | 0.39 |
| AP16 | 0.68 | 0.68 | 0.46 | 0.21 | 0.51 | 0.46 | 0.51 | 0.71 | 0.33 | 0.51 | 0.46 | 0.26 | 0.26 | 0.26 | 0.68 | | 0.68 | 0.68 | 0.26 | 0.38 | 0.22 | 0.39 | 0.44 |
| AP17 | 0.17 | 0.17 | 0.33 | 0.29 | 0.17 | 0.37 | 0.29 | 0.54 | 0.24 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.32 | | 0.17 | 0.17 | 0.29 | 0.29 | 0.17 | 0.33 |
| AP18 | 0.67 | 0.49 | 0.46 | 0.21 | 0.49 | 0.29 | 0.49 | 0.69 | 0.44 | 0.42 | 0.44 | 0.20 | 0.32 | 0.32 | 0.56 | 0.32 | 0.83 | | 0.17 | 0.22 | 0.36 | 0.20 | 0.41 |
| AP19 | 0.83 | 0.83 | 0.46 | 0.46 | 0.49 | 0.54 | 0.73 | 0.75 | 0.61 | 0.30 | 0.62 | 0.78 | 0.36 | 0.67 | 0.62 | 0.74 | 0.83 | 0.83 | | 0.63 | 0.61 | 0.53 | 0.58 |
| AP20 | 0.83 | 0.67 | 0.61 | 0.61 | 0.49 | 0.64 | 0.49 | 0.69 | 0.37 | 0.44 | 0.62 | 0.53 | 0.20 | 0.37 | 0.62 | 0.62 | 0.71 | 0.78 | 0.37 | | 0.54 | 0.37 | 0.53 |
| AP21 | 0.64 | 0.64 | 0.46 | 0.46 | 0.46 | 0.63 | 0.51 | 0.66 | 0.46 | 0.46 | 0.64 | 0.64 | 0.39 | 0.21 | 0.64 | 0.78 | 0.71 | 0.64 | 0.39 | 0.46 | | 0.39 | 0.39 |
| AP22 | 0.83 | 0.83 | 0.51 | 0.46 | 0.61 | 0.54 | 0.67 | 0.80 | 0.62 | 0.47 | 0.61 | 0.51 | 0.78 | 0.47 | 0.61 | 0.61 | 0.83 | 0.80 | 0.47 | 0.63 | 0.61 | | 0.26 |
| AP23 | 0.67 | 0.67 | 0.46 | 0.46 | 0.61 | 0.54 | 0.62 | 0.70 | 0.56 | 0.42 | 0.56 | 0.30 | 0.56 | 0.42 | 0.74 | 0.56 | 0.67 | 0.59 | 0.42 | 0.47 | 0.61 | 0.74 | |

Likewise, discordance matrices can be taken from the preference index, where the data being compared is placed in the concordance matrices position, how to obtain the data using equation (9) and equation (11). The results can be seen in Table 8.

Table 8. Discordance Matrices

| Alt | AP01 | AP02 | AP03 | AP04 | AP05 | AP06 | AP07 | AP08 | AP09 | AP10 | AP11 | AP12 | AP13 | AP14 | AP15 | AP16 | AP17 | AP18 | AP19 | AP20 | AP21 | AP22 | AP23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP01 | | 0.32 | 0.94 | 0.94 | 0.70 | 0.41 | 0.75 | 0.51 | 0.94 | 0.82 | 0.94 | 1.18 | 1.00 | 0.94 | 0.84 | 0.74 | 0.97 | 0.62 | 0.85 | 0.68 | 0.67 | 0.94 | 1.90 |
| AP02 | 3.17 | | 0.94 | 0.94 | 1.59 | 0.67 | 0.76 | 0.60 | 0.94 | 0.94 | 0.94 | 1.14 | 1.22 | 1.41 | 0.94 | 0.94 | 0.95 | 0.94 | 1.44 | 1.17 | 0.95 | 0.94 | 1.92 |
| AP03 | 1.07 | 1.07 | | 0.94 | 1.07 | 0.83 | 0.75 | 0.60 | 1.12 | 1.42 | 2.08 | 2.68 | 1.71 | 1.70 | 1.32 | 1.10 | 1.37 | 0.84 | 1.40 | 0.99 | 1.42 | 2.26 | 2.73 |
| AP04 | 1.07 | 1.07 | 1.07 | | 1.07 | 0.90 | 0.86 | 0.82 | 1.31 | 1.44 | 1.84 | 1.57 | 1.13 | 1.48 | 1.31 | 1.14 | 0.93 | 1.07 | 1.23 | 1.07 | 1.18 | 1.83 | 1.07 |
| AP05 | 1.43 | 0.63 | 0.94 | 0.94 | | 0.85 | 0.88 | 0.64 | 0.94 | 0.94 | 0.94 | 1.26 | 1.34 | 1.55 | 0.94 | 0.94 | 0.97 | 0.94 | 1.58 | 1.94 | 1.92 | 1.01 | 1.84 |
| AP06 | 2.45 | 1.48 | 1.21 | 1.12 | 1.18 | | 0.82 | 0.73 | 1.24 | 0.98 | 0.87 | 1.51 | 0.76 | 0.88 | 0.73 | 0.67 | 0.84 | 0.98 | 0.87 | 1.07 | 0.91 | 1.06 | 1.09 |
| AP07 | 1.34 | 1.31 | 1.34 | 1.17 | 1.13 | 1.23 | | 0.32 | 0.78 | 0.94 | 1.84 | 5.89 | 1.79 | 1.89 | 1.21 | 1.33 | 0.76 | 1.69 | 1.62 | 1.42 | 1.35 | 2.54 | 2.28 |
| AP08 | 1.95 | 1.66 | 1.66 | 1.22 | 1.56 | 1.37 | 3.15 | | 3.61 | 5.60 | 5.80 | 10.38 | 5.09 | 4.99 | 4.68 | 2.01 | 2.75 | 4.41 | 4.23 | 4.30 | 3.77 | 5.93 | 4.08 |
| AP09 | 1.07 | 1.07 | 0.89 | 0.77 | 1.07 | 0.81 | 1.28 | 0.46 | | 0.85 | 1.44 | 1.48 | 1.60 | 1.19 | 1.07 | 0.98 | 0.88 | 1.07 | 1.22 | 1.07 | 1.07 | 2.91 | 1.21 |
| AP10 | 1.22 | 1.07 | 0.71 | 0.69 | 1.07 | 1.02 | 1.06 | 0.69 | 1.17 | | 0.99 | 3.00 | 4.87 | 2.96 | 0.29 | 0.50 | 1.44 | 0.86 | 3.12 | 1.34 | 1.10 | 2.54 | 2.15 |
| AP11 | 1.07 | 1.07 | 0.48 | 0.54 | 1.07 | 1.14 | 0.54 | 0.50 | 0.70 | 1.01 | | 1.53 | 1.81 | 1.95 | 0.38 | 0.27 | 1.15 | 0.83 | 2.12 | 1.17 | 1.07 | 2.47 | 1.01 |
| AP12 | 0.85 | 0.88 | 0.37 | 0.64 | 0.79 | 0.66 | 0.17 | 0.26 | 0.67 | 0.33 | 0.65 | | 0.26 | 0.34 | 0.20 | 0.60 | 0.52 | 0.28 | 0.25 | 0.79 | 1.07 | 0.90 | 0.56 |
| AP13 | 1.00 | 0.82 | 0.58 | 0.89 | 0.75 | 1.31 | 0.56 | 0.57 | 0.63 | 0.21 | 0.55 | 3.90 | | 1.07 | 0.17 | 0.79 | 0.39 | 0.89 | 0.51 | 1.19 | 1.66 | 0.87 | 0.73 |
| AP14 | 1.07 | 0.71 | 0.59 | 0.68 | 0.65 | 1.14 | 0.53 | 0.58 | 0.84 | 0.34 | 0.51 | 2.91 | 0.94 | | 0.21 | 0.43 | 0.54 | 0.15 | 0.77 | 1.20 | 1.07 | 0.94 | 0.45 |
| AP15 | 1.19 | 1.07 | 0.76 | 0.76 | 1.07 | 1.38 | 0.83 | 0.83 | 0.94 | 3.44 | 2.66 | 4.94 | 5.80 | 4.74 | | 0.83 | 1.79 | 1.79 | 5.12 | 1.61 | 1.07 | 3.71 | 1.82 |
| AP16 | 1.35 | 1.07 | 0.91 | 0.88 | 1.07 | 1.49 | 0.75 | 0.75 | 1.02 | 2.01 | 3.68 | 1.68 | 1.46 | 2.34 | 1.21 | | 0.96 | 1.47 | 2.51 | 2.26 | 1.07 | 1.85 | 0.84 |
| AP17 | 1.03 | 1.05 | 0.73 | 1.07 | 1.03 | 1.20 | 1.32 | 0.80 | 1.14 | 0.69 | 0.87 | 1.92 | 2.18 | 1.84 | 0.56 | 1.04 | | 0.78 | 1.93 | 1.27 | 1.07 | 2.32 | 2.77 |
| AP18 | 1.61 | 1.07 | 1.20 | 0.94 | 1.07 | 1.02 | 0.59 | 0.58 | 0.94 | 1.17 | 1.20 | 3.59 | 3.59 | 6.75 | 0.56 | 0.68 | 1.28 | | 3.46 | 1.07 | 1.29 | 1.49 | 2.44 |
| AP19 | 1.18 | 0.69 | 0.71 | 0.81 | 0.63 | 1.15 | 0.62 | 0.68 | 0.82 | 0.32 | 0.47 | 3.95 | 0.86 | 1.29 | 0.20 | 0.40 | 0.52 | 0.29 | | 0.99 | 1.05 | 0.94 | 0.65 |
| AP20 | 1.47 | 0.85 | 1.01 | 0.94 | 0.52 | 0.94 | 0.71 | 0.67 | 0.94 | 0.75 | 0.85 | 1.26 | 0.94 | 0.83 | 0.62 | 0.44 | 0.78 | 0.94 | 1.01 | | 0.74 | 0.94 | 1.35 |
| AP21 | 1.48 | 1.05 | 0.70 | 0.85 | 0.52 | 1.10 | 0.74 | 0.77 | 0.94 | 0.91 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.77 | 0.95 | 1.36 | | 0.94 | 0.46 |
| AP22 | 1.07 | 1.07 | 0.44 | 0.55 | 0.99 | 0.94 | 0.39 | 0.44 | 0.34 | 0.39 | 0.40 | 1.11 | 1.07 | 1.07 | 0.27 | 0.54 | 0.43 | 0.67 | 1.07 | 1.07 | 1.07 | | 1.03 |
| AP23 | 0.53 | 0.52 | 0.37 | 0.93 | 0.54 | 0.92 | 0.44 | 0.67 | 0.83 | 0.47 | 0.99 | 1.79 | 1.37 | 2.21 | 0.55 | 1.19 | 0.36 | 0.41 | 1.53 | 0.74 | 2.17 | 0.97 | |

From the results obtained from the discordance matrices, then find the threshold concordance matrices using equation (12) whose data is taken from the concordance matrices, with the aim of eliminating the data. The concordance matrices data element will be worth 1 if it has a value greater than the threshold concordance matrices, it will be given a 0 value if the data element value is less than the threshold concordance matrices.

The discordance matrices must also go through the same thing, where the data is sourced from Table 6 by first finding the value of the threshold discordance matrices, which can be done using equation (13). The result will be given a value of 1 if the discordance matrices element value is greater than the weight of the threshold

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discordance matrices, and will be given a value of 0 if the discordance matrices data element is less than the threshold discordance matrices.

With the finding of the results of the two matrices, both threshold concordance matrices and threshold discordance matrices, then the results of the two threshold matrices, each data element with a position corresponding to the matrices is multiplied by one another, this can be done using equation (14 ). Obtaining these results will of course be an objective rating determination. The results can be seen in Table 9.

Table 9. Aggregate Dominant Matrices

| Alt | AP01 | AP02 | AP03 | AP04 | AP05 | AP06 | AP07 | AP08 | AP09 | AP10 | AP11 | AP12 | AP13 | AP14 | AP15 | AP16 | AP17 | AP18 | AP19 | AP20 | AP21 | AP22 | AP23 | TOTAL | RATING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP01 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 10 | 7 |
| AP02 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 11 | 6 |
| AP03 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 17 | 2 |
| AP04 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 10 |
| AP05 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 10 | 8 |
| AP06 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 6 | 11 |
| AP07 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 8 | 9 |
| AP08 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 4 | 13 |
| AP09 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 13 |
| AP10 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 13 |
| AP11 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 13 |
| AP12 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 13 |
| AP13 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 6 | 12 |
| AP14 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 6 | 12 |
| AP15 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 14 | 3 |
| AP16 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 22 | 1 |
| AP17 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 22 | 1 |
| AP18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 22 | 1 |
| AP19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 22 | 1 |
| AP20 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 14 |
| AP21 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 13 | 4 |
| AP22 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 12 | 5 |
| AP23 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 9 |

## DISCUSSIONS

The importance of input data using AHP greatly supports the success of determining the eigenvector using AHP which can be used as the weight of the criteria to be used. Calculations using the ELECTRE method certainly provide a lot of perfect understanding, in order to provide optimal results, because an error in determining the comparison to the preference index will result in fatal consequences for the preparation of two-dimensional matrices both on concordance matrices and discordance matrices and also affect decision support. Determination of the threshold is a good measure in filtering the data elements of the matrices and determining the weight of the aggregate dominant matrix which leads to the determination of the optimal decision rating in numerical form.

## CONCLUSION

The application of the ELECTRE method to selection of object-based apps programss gives good and optimal results as decision support. The decisions obtained from a very complicated process give a conclusion to the selection of object-based apps programss (OOP) using a combination of two methods of Analytic Hierarchy Process (AHP) and the ELECTRE method, giving the following results. Judging from the weights generated from the Aggregate Dominant Matrices, in determining the rating of the program application that was ranked first, it was found 4 program applications with the same weight of 22, namely AP16, AP17, AP18 and AP19, followed by the second rank AP03 with a weight of 17, while the third rank was won by AP15 with a weight of 14, while the others are not included in the selected category. This proves that the combination of the two methods AHP and ELECTRE is able to provide optimal decision support and can be used as a reference in selecting products or others that are quantitative in nature supported by criteria in the form of ordinal values.

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