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RESEARCH ARTICLE

Implementation of the Analytical Hierarchy Process Method and Multi Objective Optimization on the Basis of Ratio Analysis in the Selection of Insurance Products

Haviluddin[a,1]*; Edy Budiman[a,2]; Rendy Ramadhan [a,3]

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Abstract

Insurance product offerings are not always understood by prospective customers (CN) due to limited information related to products. This can cause confusion so that CN does not want to buy it. The purpose of this study is to analyze the selection of insurance products PT. AIA Financial Samarinda, East Kalimantan, Indonesia uses the Analytical Hierarchy Process (AHP) and Multi Objective Optimization on the Basis of Ratio Analysis (MOORA) approach so that CNs can choose based on insurance product facilities that match their abilities. In this study, as many as 10 types of insurance products and 10 CN criteria were then analyzed based on the two methods used. Then, the calculation accuracy of the two methods has been using the Confusion Matrix (CM) method. Based on the results of CM calculations from 27 CN datasets with a conformity level of 81.5%, it has been obtained which indicates that the two methods can be implemented as an alternative in choosing insurance products according to ability or based on CN criteria. The results show that this method is quite effective, efficient and relatively easy to use in determining insurance products that meet the criteria or according to CN's economic capabilities.

Keyword: AHP; MOORA; SPK; Insurance Products; CM

Introduction

CNs often get confused in determining insurance products due to lack of understanding of the information received from the types and facilities of the products, payment methods to how to make claims. For this reason, a mechanism for delivering the right information is needed and can make it easier for CNs to help understand insurance products so that they are not wrong in choosing based on their economic capabilities.

Various studies related to the selection of alternative information by applying various artificial intelligence methods continue to be carried out and applied in various fields by researchers. Sunoto & Susanto (2017) have applied the AHP method in the selection of life insurance using 5 criteria for consideration. Based on experiments, the greatest value has been determined to be an alternative life insurance product as the best alternative. The Pairwise Comparison (PC) method based on 9 rating scales for each criterion and alternative has been implemented. The results show that the AHP method can be used in choosing life insurance products[1]. Apriliani Akhadun & Hidayat (2020) have used the AHP method for the selection of BRI life insurance products in Semarang using 4 criteria and 4 insurance products with accurate analysis results applying CI and CR. Based on experiments that have been tested on a CN, it has shown the ability of the AHP method to provide alternative choices for the choice of 4 Darlink insurance products, namely SAFE, STABIL, DYNAMIC, and AGGRESSIVE. The results of the study have shown that the Darlink DINAMIS insurance product is the choice of CN[2]. Ramadani et al (2019) have applied the MOORA method for the selection of life insurance products at PT Bhinneka Life Indonesia Pematangsiantar based on 5 criteria and 5 alternatives. Based on the experiment, the determination of the weight value for the assessment of each alternative is very influential[3]. Primadasa & Alfiarini (2019) have applied the AHP and MOORA methods to the DSS for evaluating employee performance using 10 criteria, the weights of which have been calculated using the AHP method and analyzed using the MOORA method. Based on the experiment, the calculation of the MOORA method has got the highest score of 0.070800827 so that the employee is recommended to get a reward[4]. Putri

[1-3] Informatics Study Program, Faculty of Engineering, Mulawarman University

*) corresponding author

Haviluddin

Informatics Study Program, Faculty of Engineering, Mulawarman University
Gunung Kelua Campus, Jalan Sambaliung No.9 Samarinda, East Kalimantan, Indonesia 75119

Email: haviluddin@unmul.ac.id

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Taqwa Prasetyaningrum (2020) has applied the AHP method with 6 criteria to determine the level of risk of insurance claims. Based on the calculation of the overall composite weight (OCW) occupation is the highest probability value as the final decision. Meanwhile, the highest alternative value is not recommended to be paid because it has a high potential risk. The results of testing the risk level of product insurance claims of 68% have been obtained[5]. Irwana et al (2018) have applied the MOORA method for Indonesian citizens receiving home renovation assistance based on 6 criteria. The experimental results have resulted in a suitability rating of each alternative[6]. Nur et al (2018) have applied the MOORA method for selecting cellular operators using 5 criteria and 6 alternatives. Based on experiments, multi-objective optimization techniques can be applied to complete the selection of cellular operators with 5 steps according to the rules of the MOORA method[7]. Utami & Ruskan (2020) have applied the MOORA method to the selection of foundation alumni scholarships using 8 criteria and 5 alternatives. Based on the ranking results, it is found that alternative 5 with a value of A5 = 0.2248 is the best alternative with the largest Qi value that will get a scholarship.[8]. Siregar et al (2021) have applied the MOORA method in providing scholarships for the best students using 4 criteria and 10 alternatives. Based on data processing, it can be concluded that the application of DSS with the MOORA method in the selection process for scholarship recipients to improve academic achievement is carried out using criteria consisting of income and parental dependents, semester and GPA are in accordance[9]. Rahmadani et al (2017) have applied the MOORA method on television purchase recommendations as a wise family solution based on 5 assessment criteria, namely: Model, Quality, Brand, Size and Price. The television alternatives used consist of 6 types, namely Polytron, Samsung, Panasonic, LG, Toshiba, and Philips. Based on the experiment, the MOORA method is quite effective to be applied in determining the purchase of television. Based on the research results obtained alternative A1 (Polytron) 0.1701 as rank 1, alternative A5 (Philips) 0.1652 as rank 2 and Alternative A2 (Toshiba) 0.0947 as rank 3[10].

Therefore, the ability of artificial intelligence methods in analyzing decisions is very necessary [11]–[13]. This paper aims to apply the AHP and MOORA methods in providing alternative insurance product choices. Furthermore, the results of this study are expected to provide several alternatives for selecting insurance products for CN and the marketing department of PT. AIA Financial Samarinda, East Kalimantan, Indonesia in providing services. This paper consists of the research background. The second is to explain the applied approach technique. Third, explain the analysis using the AHP and MOORA approaches. Finally, conclusions and plans for further research.

Methods

In this section, we will briefly describe the AHP and MOORA techniques, the sample data, and the measurement of the analytical results applied.

A. Analytic Hierarchy Process (AHP) Method

The AHP method was developed by Thomas L. Saaty in the 1970s which is a method for measuring the representation of problems that is structured and systematic. The most important part of this method is evaluating alternative solutions based on the criteria used. In principle, this method compares importance and weights to get a consistent solution[14]–[19].

In this study, the stages of the AHP method, first, define the problem, which is to help obtain alternative choices of insurance products. Second, compiling a hierarchical structure based on 10 criteria and 10 alternative choices. Third, compiling a pairwise comparison matrix for each criterion. Where, comparisons are displayed according to the choice of the CN based on the level of ability or importance scale. Fourth, normalization of the matrix by dividing the element value by its total value. Fifth, look for the eigenvector value and test its consistency with the condition that if it is not consistent then it is necessary to retrieve the data (preference). Sixth, repeat steps 3, 4 and 5 for all stages. Seventh, calculate the eigenvector value (element weight) from the pairwise comparison matrix. Eighth, test the consistency of the hierarchy with the condition that the value of CR<0,

$$CI = \frac{(eigen\ maks - n)}{n-1} \quad (1)$$

$$CR = \frac{CI}{RI} \quad (2)$$

Where, CR is consistency ratio; CI is consistency index; RI is the ratio index; Eigen max is the maximum Eigen value of the pairwise comparison matrix. The AHP algorithm applied can be seen below.

AHP Algorithm

```
Declaration
var pairwise_comparison, eigen_value, priority_weight, synthesis_weight, eigen_max, pairwise_sum,
consistency_test: array;
var max_lambda, consistency_index, consistency_ratio, eigen_value, sum_eigen_max, sum : double;
var criteria = 10;
var index_ratio = 1.49;
algorithm:
Read(pairwise_comparison)
  for i = 0 to count(pairwise_comparison)
       eigen_value[i] <- product(pairwise_comparison[i])^1/criteria
       amount <- 0
       for j=0 to count(pairwise_comparison[i])
              sum <- sum+ pairwise_comparison[j][i]
```

```
      number_pairwise[i] <- sum
  sum_eigen_value <- array_sum(eigen_value)
  for i=0 to count(eigen_value)
      priority_weight[i] <- eigen_value[i] / sum_eigen_value
  for i = 0 to count(pairwise_comparison)
      for j=0 to count(pairwise_comparison[i])
              test_consistency[i][j] <- pairwise_comparison[i][j] / number_pairwise[i]
  for i = 0 to count(consistency_test)
      weight_synthesis[i] <- array_sum(consistency_test[i])
  for i = 0 to count(synthesis_weight)
      eigen_max[i] <- weight_synthesis[i] / priority_weight[i]
  sum_eigen_max <- array_sum(eigen_max)
  max_lambda <- max_eigen_number / criteria
  consistency_index <- (max_lambda – criteria)/(criterion -1)
  consistency_ratio <- (consistency_index / index_ratio)
  if (consistency_ratio > 0.1) then
      write("Consistent")
  else
      write("Inconsistent")
 endif
```

B. Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) method

The MOORA method or also called multi-objective optimization is part of the Multi Criteria Decision Making (MCDM). In principle, this method performs different attribute optimization processes based on the specified conditions. This method in making decisions by finding the greatest value as the best alternative[20], [21]. Meanwhile, the stages of the MOORA method, first, are to create a decision matrix Xij, where i is the index for alternatives, m is the number of alternatives, j represents n in the number of attributes. Second, the normalization of the decision matrix using Equation 3.

$$x_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x^2\, ij}} \qquad (3)$$

Where, i is the index for the alternative, j is the index for the attribute, m is the number of alternatives.
Third, optimization of attributes using Equation 4 and Equation 5.

$$yi = \sum_{j=1}^{g} x^* ij - \sum_{j=g+1}^{n} x^* ij \qquad (4)$$

$$Y_{i=} \sum_{j} \overset{g}{=} 1 = Wj\, X^* ij - \sum_{j}^{n} = g + 1\, Wj\, X^* ij \qquad (5)$$

Fourth, sort the best alternative based on the value of Yi [+ or -] in the decision matrix of the maximum (benefit) and minimal (cost) attribute. The ordinal ranking order of Yi indicates the highest and lowest preference values. The MOORA algorithm used can be seen below.

Where, g is the maximum attribute, (ng) is the minimum attribute and Yi is the alternative normalization to i on all attributes, Wj is the weight of the attribute.

MOORA Algorithm

```
Declaration
var decision_matrix, array_divisor, weights, normalized_matrix, weighted_matrix,
       max_array,min_array, preference_value, criteria: array;

var divisor, max, min : double;
algorithm:
Read(decision_matrix)

for i = 0 to count(decision_matrix)
       divisor <- 0
       for j=0 to count(decision_matrix[i])
               divisor <- (divisor + decision_matrix[j][i])^2

       divisor_array[i] <- sqrt(divisor)

for i = 0 to count(decision_matrix)
       for j=0 to count(decision_matrix[i])
                     normalization_matrix[i][j] <- decision_matrix[i][j] / array_divisor[j]

for i = 0 to count(normalized_matrix)
       for j=0 to count(normalized_matrix[i])
                     weighted_matrix[i][j] <- normalized_matrix[i][j] * weight[j]
```

```
Read(criteria)
for i = 0 to count(weighted_matrix)
        max <- 0
        min <- 0
        for j=0 to count(weighted_matrix[i])
                if (criteria[j][type]=='benefit')
                        max <- max + weighted_matrix[i][j]
                else
                        min <- min + weighted_matrix[i][j]
        max_array[i] <- max
        max_array[i] <- min
        value_preference[i] <- max - min
```

C. *Measurement Accuracy*

In this study, the measurement of the accuracy of the AHP and MOORA methods has used the Confusion Matrix (CM) method and the results of interviews are also a benchmark in determining whether the results of the analysis can make it easier for CNs in determining insurance product choices. [20], [22]–[24]. In principle, the CM method calculates the performance or correctness of the selection process by analyzing how well it recognizes records from different classes using Equation 6.

$$\text{Accuracy} = \frac{TP+TN}{TP+FN+FP+TN} \text{ X } 100\% \quad (6)$$

Where, True Positive (TP) is the correct number and classification of class 1 data; True Negative (TN) is the correct number and classification of class 0 data; False Positive (FP) is the number of class 0 data that is incorrectly classified as class 1; False Negative (FN) is the number of class 1 data that is incorrectly classified as class 0.

D. *Data Sampling*

In this study, insurance products consist of 10 (ten) namely (A1) Critical Protection, (A2) Prolink Assurance, (A3) Power Pro Life, (A4) Prima Plus Protection, (A5) Income Protection Plan, (A6) Prolink Platinum Assurance, (A7) Proterm Protection, (A8) Priority Plus Assurance, (A9) Infinite Plus Assurance, and (A10) Infinite Link Assurance. Meanwhile, 10 (ten) criteria were set as the basis for the analysis consisting of (C1) height (cm), (C2) weight (kg), (C3) age, (C4) income (Rp), (C5) expenses (Rp), (C6) occupation, (C7) medical history, (C8) gender, (C9) marital status, and (C10) active or passive smoking were obtained from PT. AIA Financial Samarinda, East Kalimantan, Indonesia. Meanwhile, the data for CNs can be seen in Table I.

TABLE I. Data CN Insurance PT. AIA Financial Samarinda

Prospective customer (CN)	**Criteria**									
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**
CN1	156	58	21	10000000	7000000	1	0	P	0	0
CN2	166	51	21	3000000	1500000	1	0	L	0	1
CN3	158	48	21	15000000	10000000	2	0	P	0	0
CN4	169	65	36	25000000	15000000	1	0	L	1	0
CN5	160	78	41	12000000	9000000	1	0	P	1	0
CN6	174	75	39	15000000	8000000	1	0	L	1	1
CN7	173	78	36	6000000	5000000	1	0	P	1	0
CN8	167	68	41	15000000	9000000	1	0	L	1	1
CN9	160	59	35	12000000	8000000	1	0	P	1	0
CN10	165	58	29	6000000	3000000	1	0	L	1	1
CN11	173	69	33	13000000	10000000	1	0	L	1	1
CN12	158	49	25	5000000	3000000	1	0	P	0	0
CN13	167	40	37	6500000	2000000	3	0	L	1	1
CN14	178	60	27	7000000	4000000	3	0	L	0	1
CN15	166	65	35	8000000	6000000	3	0	L	1	0
CN16	164	63	28	7000000	5000000	1	0	L	1	1
CN17	168	62	22	5000000	2500000	1	0	L	0	1
CN18	166	56	25	5000000	3000000	1	0	L	0	1
CN19	154	55	25	6000000	2000000	1	0	P	0	0
CN20	164	66	23	3000000	2000000	1	0	L	0	1
CN21	166	52	34	8000000	5000000	3	0	L	1	1
CN22	176	60	32	8500000	5000000	3	0	L	1	1
CN23	176	76	27	7000000	4000000	1	0	L	0	1
CN24	155	48	28	5000000	3500000	2	0	P	1	0
CN25	160	44	26	4000000	2000000	2	0	P	1	0
CN26	176	61	30	8000000	4000000	3	0	L	0	1
CN27	167	58	34	10000000	6000000	3	1	P	1	0

Description:
(C1) height (cm), (C2) weight (kg), (C3) age, (C4) income (Rp), (C5) expenses (Rp), (C6) occupation, (C7) medical history, (C8) gender, (C9) marital status, and (C10) active or passive smoker. C6: (1) self-employed, (2) employee, (3) civil servant.
C7: (0) none, (1) exists.
C9: (0) unmarried, (1) married.
C10: (0) passive, (1) active

Results and Discussion

This section describes the results of the analysis of the selection of insurance products by applying the AHP and MOORA methods. In this experiment, starting with data collection and cleaning, then using the AHP and MOORA methods to get the product ranking selected by CN. First, data collection and cleaning using literature study and interview techniques according to the hierarchical structure rules as outlined in the criteria and alternative choices have been carried out. This stage has been carried out by considering the choices or judgments of the CNs based on the criteria. Second, the normalization of the criteria PC matrix by dividing the value of the elements by the total value using Equation (2). Third, calculating the eigenvector values to get the highest and lowest ranking values and testing the consistency using Equations (1) and (2) has been done. The results of the comparison and eigenvector calculations can be seen in Table II.

Next, test the consistency by calculating the max eigenvector obtained by dividing the synthesis weight by the priority weight. Then, look for the max lambda by dividing the total number of synthesis weights by the total criteria. Next, calculate the Consistency Index (CI) by calculating the total max lambda divided by the total criteria then divided by 9 and calculating the Consistency Ratio (CR) by dividing the CI value by the ratio index value. In this experiment, the max lambda is 10.21; A CI of 0.02 and a CR of 0.02 have been obtained. This means that if the value of CR 0.1 (0.02 0.1) then the consistent ratio is acceptable or consistent. The results of the calculation of the AHP weight consistency test can be seen in Table III and Table IV.

TABLE III. Results of Comparison and Eigenvector Calculations

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Eigen Value	Priority Weight
C1	1	0.5	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.3	0.42	0.04
C2	2	1	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.3	0.48	0.04
C3	3	3	1	0.5	0.5	3	0.5	3	3	3	1.51	0.13
C4	3	3	2	1	0.5	0.3	0.5	0.3	0.3	0.3	0.75	0.06
C5	3	3	2	2	1	3	0.3	3	3	3	1.99	0.17
C6	3	3	0.3	3	0.3	1	0.3	3	3	3	1.39	0.12
C7	3	3	3	2	3	3	1	3	3	3	2.58	0.22
C8	2	2	0.3	3	0.3	0.3	0.3	1	0.3	0.3	0.66	0.6
C9	2	2	0.3	3	0.3	0.3	0.3	3	1	2	0.99	0.8
C10	3	3	0.3	3	0.3	0.3	0.3	3	0.5	1	0.93	0.8

TABLE III IAHP Weight Consistency Test

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Synthesis Weight	Max Eigen
C1	0.04	0.02	0.03	0.02	0.05	0.03	0.08	0.02	0.03	0.02	0.35	9.65
C2	0.08	0.04	0.03	0.02	0.05	0.03	0.08	0.02	0.03	0.02	0.41	9.89
C3	0.12	0.13	0.10	0.03	0.07	0.25	0.08	0.15	0.20	0.18	1.31	10,14
C4	0.12	0.13	0.20	0.06	0.07	0.03	0.12	0.02	0.02	0.02	0.78	12,20
C5	0.12	0.13	0.20	0.11	0.14	0.25	0.08	0.15	0.20	0.18	1.56	9.18
C6	0.12	0.13	0.03	0.17	0.05	0.08	0.08	0.15	0.20	0.18	1.19	9.99
C7	0.12	0.13	0.30	0.11	0.43	0.25	0.24	0.15	0.20	0.18	2.11	9.55
C8	0.08	0.09	0.03	0.17	0.05	0.03	0.08	0.05	0.02	0.02	0.61	10.78
C9	0.08	0.09	0.03	0.17	0.05	0.03	0.08	0.15	0.07	0.12	0.85	10,13
C10	0.12	0.13	0.03	0.17	0.05	0.03	0.08	0.15	0.03	0.06	0.84	10.58
Amount	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00	102.06
							Max lambda					**10.21**
							Consistency Index (CI)					**0.02**
							Consistency Ratio (CR)					**0.02**

After the weight search is done, the next step is to do the MOORA calculation to get the most ranked insurance products based on the best order. First, make a decision matrix and normalize it using Equation (3) with the rating scale being used as a calculation for the assessment process. The results of the normalized decision matrix can be seen in Table IV.

Second, calculating preferences using Equation (5) by adding the value of the benefit attribute has been done. Likewise, the value of the cost attribute has been summed. So the value of Yi has been obtained by reducing the benefits and costs. Based on the experiment, the highest Yi value is the best alternative choice of insurance product that has been obtained. The results of the calculation of preferences can be observed in Table V. Meanwhile, the analysis of the results of the calculation of 27 CN is in Table VI.

TABLE IV Decision Matrix

Alternative	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
A1	0.31	0.26	0.20	0.17	0.16	0.29	0.29	0.40	0.00	0.00
A2	0.31	0.26	0.40	0.25	0.24	0.39	0.36	0.40	0.12	0.10
A3	0.31	0.44	0.30	0.33	0.40	0.39	0.29	0.20	0.12	0.10
A4	0.31	0.35	0.40	0.42	0.32	0.39	0.29	0.40	0.25	0.10
A5	0.21	0.26	0.30	0.33	0.32	0.29	0.29	0.20	0.37	0.42
A6	0.41	0.44	0.20	0.33	0.32	0.29	0.36	0.40	0.37	0.31
A7	0.31	0.26	0.50	0.08	0.08	0.29	0.29	0.20	0.62	0.42
A8	0.41	0.26	0.20	0.42	0.40	0.29	0.36	0.20	0.25	0.42
A9	0.21	0.26	0.30	0.33	0.40	0.19	0.36	0.40	0.37	0.42
A10	0.31	0.26	0.20	0.33	0.32	0.29	0.29	0.20	0.25	0.42
Divider	9.70	11.36	10.00	12.00	12.37	10,30	14.00	5.00	8.12	9.59
AHP Weight	0.04	0.04	0.13	0.06	0.17	0.12	0.22	0.06	0.08	0.08

TABLE V Preference Calculation Results

Alternative	Max (C1+C2+C4+C5+C6+C7+C8+C9+C10)	Min (C3)	Yi
A6	0.301	0.026	0.276
A8	0.300	0.026	0.274
A9	0.297	0.039	0.259
A4	0.268	0.052	0.217
A5	0.268	0.039	0.229
A10	0.261	0.026	0.236
A3	0.258	0.039	0.220
A2	0.245	0.052	0.194
A7	0.235	0.064	0.171
A1	0.180	0.026	0.155

TABLE VI Analysis Results of 27 CN

Prospective Customers (CN)	Criteria										Product Alternative	Preferred Percentage
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		
CN1	156	58	21	10000000	7000000	1	0	P	0	0	A6	27%
CN2	166	51	21	3000000	1500000	1	0	L	0	1	A2	26%
CN3	158	48	21	15000000	10000000	2	0	P	0	0	A6	28%
CN4	169	65	36	25000000	15000000	1	0	L	1	0	A6	28%
CN5	160	78	41	12000000	9000000	1	0	P	1	0	A6	27%
CN6	174	75	39	15000000	8000000	1	0	L	1	1	A6	27%
CN7	173	78	36	6000000	5000000	1	0	P	1	0	A2	29%
CN8	167	68	41	15000000	9000000	1	0	L	1	1	A6	27%
CN9	160	59	35	12000000	8000000	1	0	P	1	0	A8	27%
CN10	165	58	29	6000000	3000000	1	0	L	1	1	A2	29%
CN11	173	69	33	13000000	10000000	1	0	L	1	1	A6	27%
CN12	158	49	25	5000000	3000000	1	0	P	0	0	A2	26%
CN13	167	40	37	6500000	2000000	3	0	L	1	1	A2	30%
CN14	178	60	27	7000000	4000000	3	0	L	0	1	A2	26%
CN15	166	65	35	8000000	6000000	3	0	L	1	0	A2	26%
CN16	164	63	28	7000000	5000000	1	0	L	1	1	A2	27%
CN17	168	62	22	5000000	2500000	1	0	L	0	1	A2	26%
CN18	166	56	25	5000000	3000000	1	0	L	0	1	A2	28%
CN19	154	55	25	6000000	2000000	1	0	P	0	0	A2	26%
CN20	164	66	23	3000000	2000000	1	0	L	0	1	A2	26%
CN21	166	52	34	8000000	5000000	3	0	L	1	1	A2	27%
CN22	176	60	32	8500000	5000000	3	0	L	1	1	A2	27%
CN23	176	76	27	7000000	4000000	1	0	L	0	1	A2	26%
CN24	155	48	28	5000000	3500000	2	0	P	1	0	A2	29%
CN25	160	44	26	4000000	2000000	2	0	P	1	0	A2	28%
CN26	176	61	30	8000000	4000000	3	0	L	0	1	A2	26%
CN27	167	58	34	10000000	6000000	3	1	P	1	0	A6	26%

In this experiment, the accuracy of the ranking results of insurance products has been carried out using the CM method with Equation (6) on all criteria that have been tested significant. Based on the calculation of the level of conformity 81.5% has been obtained which means that both methods can be used as an alternative in providing a choice of insurance products according to ability or according to CN criteria. Based on the experimental results, out of 27 customers, there are 22 customers in the TP category, 5 customers including FN, no customers including FP and TN. Where, the results of the CM calculation are in Table VII.

TABLE VII Confusion Matrix (CM) Calculation Results

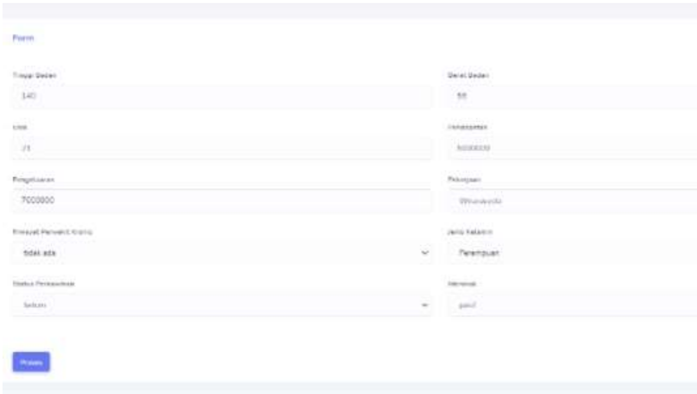
		Prediction Class	
		In accordance	It is not in accordance with
Class In fact	In accordance	22	5
	It is not in accordance with	0	0

In this study, to facilitate CN in determining insurance products, a website-based selection system has been produced. Meanwhile, the system interface in Figure 1 (a), (b), (c). Where, Figure 1 (a) shows that users are required to register before using the system. In this study, the registration that has been used is the user's email or the CN's. Figure 1 (b) form containing information on filling out CN data and selecting the type of product of interest. Figure 1 (c) the results of the ranking of the types of products of interest based on the criteria.

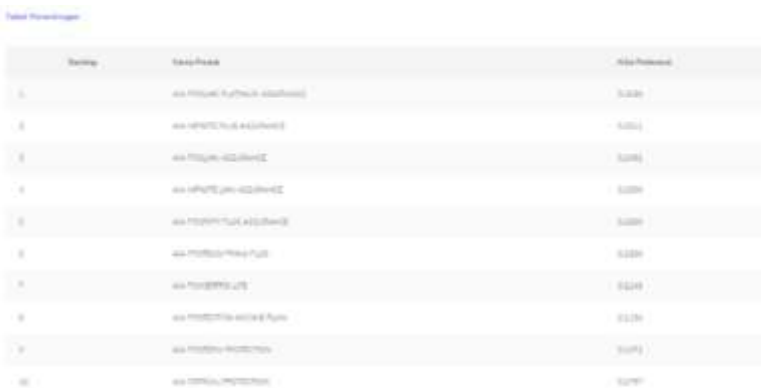
Conclusions

Analysis of insurance product selection by prospective customers (CN) using the AHP and MOORA methods has been implemented. Research data of 27 CN, 10 CN criteria and 10 insurance products have been obtained from PT. AIA Financial Samarinda, East Kalimantan, Indonesia. Measuring the accuracy of the two methods using the confusion matrix (CM) has been established. Based on the experiment, the AHP method has been able to get the weight value of each criterion. The experimental results show that max lambda is 10.21; A CI of 0.02 and a CR of 0.02 have been obtained, which means that the calculation is acceptable or consistent. Meanwhile, the results of the calculation of the MOORA method have been able to obtain the optimal value of insurance products as the final value of the assessment with an average of 27%. Where, the level of conformity is 81, 5% has been obtained which means that both methods can be used as an alternative in providing a choice of insurance products according to ability or according to CN criteria. The application of a combination of artificial intelligence and optimization methods in obtaining alternative choices will be the next research.

(a)



(b)



(c)

Picture 1.
CN interface in selecting insurance products (a) login page (b) filling form page (c) ranking results page

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