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Analysis of the Selection of the Best Household Ceramics Using the Complex Proportional Assessment (COPRAS) Method

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ABSTRACT

Rapid advances in communication and information technology due to globalization have had a significant impact on a number of industries, including the industrial sector. The industry is taking great advantage of the capabilities of this technology to search, store, distribute and present information. The ceramic sector in Indonesia looks increasingly promising every year. One type of building material that functions to cover the floor and beautify its appearance is ceramic. When choosing ceramics, consumers become confused because of the availability of various brands (vendors) with different themes and quality. When deciding on product quality, a decision support system can be implemented to offer a structured evaluation that assists stakeholders in the business and consumers in assessing high-quality ceramic options. DSS The complex proportional assessment method, or COPRAS, is used in system design. In improving the accuracy and efficiency of decision making, the COPRAS approach can evaluate several options and estimate them based on their utility level when attribute values are expressed in intervals. Based on the findings of this research, the application of the COPRAS method in the decision-making process to determine the best household ceramics can be used in selecting the best household ceramics by collecting data on ceramic criteria and the alternative used is the type of ceramic. The weights obtained for each criterion are then normalized which are then used to determine the Ui for each alternative, so that based on the results of this research the best household ceramics are obtained, namely Redhorse type ceramics with a Ui value of 100%, Fortuna type with a Ui value of 99.27%. , Prato type with a Ui value of 98.82%, Crystal type with a Ui value of 98.71%, Mulia type with a Ui value of 88.50%, Vancouver type with a Ui value of 88.24%, Murano type with a Ui value of 84.97% and the Virginia type with a Ui value of 79.77%.

Keywords: Household Ceramics; Decision-making; Copras Method;

INTRODUCTION

With continued assistance, the growth of the Indonesian ceramic industry looks more promising every year from the public and commercial sectors. Considering the abundant natural and energy resources in Indonesia (Pradana & Samsudin, 2023),

There are many benefits and opportunities for the Indonesian ceramic industry, which are further strengthened by the fact that the deposits are mined, and the ceramic raw materials are abundant and widely distributed. One type of material used in construction is floor covering, which improves the appearance of the surface ceramic. As time goes by, clay is used less and less as the main material for ceramics; instead, kaolin, ball clay, feldspar, zircon, and water are known as raw materials in the manufacturing process. (Amber, 1997).

There are many models and types of ceramic floor tiles to choose from to meet customer needs. Since ceramic floors are durable, available in various colors and designs, and do not require much maintenance, most buyers choose them. (Budiyanto, 2008). Because ceramics usually have a long service life, the presence and quality of various brands make it difficult for consumers to choose ceramics. Apart from causing confusion among consumers, choosing the wrong ceramic can also affect the length of service life of the ceramic (Nurfadila et al., 2023).

Ceramic floor tiles are ceramics available in various colors, designs, and floor sizes. Because liquids and dirt will not leave stains on ceramic floors, these floors require less maintenance than other types of floors (Roy et al., 2019). There are two categories for choosing the type of texture: floors that are directly exposed to water should use rough-textured ceramics so they are not slippery. Use smooth textured floors in other rooms, for example, the living room and bedroom, which are not often exposed to water directly (Syaputra et al., 2023).

One of the key factors that determines a company's ability to survive in a highly competitive industrial environment is quality. The dynamic state connected with products, services, personnel, practices, and environments

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that meet or exceed expectations is one definition of quality (Goetch and Davis, 2005). According to Scherkenbac (2001), consumers assess quality because they look for goods and services that meet their requirements and expectations at prices that match the value offered. One of the fundamental considerations for customers when choosing goods or services is quality. Therefore, quality is very important for business success, business expansion, and increasing competitiveness (Montgomery, 1995).

PT. Platinum Ceramics Industry (PCI), can be found in Medan City, North Sumatra 20234 on Jl. Prof. H. M. Yamin No. 74 B, Ex. Sidodadi, District. East Medan. Since 1971, PT. The Platinum Ceramics Industry (PCI) has been producing ceramics for almost 40 years. This company is a family-run company with its head office located in East Java, Indonesia, Surabaya. PCI officially changed its name to PT. Asia Victory Industries Ltd. (AVI) from its original name, PT. Founded in the Platinum Ceramics Industry in July 2002. The original PCI brand, which has been in production since 1973, is still known by that name. With 75 workers, PT. Asia Victory Industry, Ltd. manufactures 11x11 wall tiles. There are sixteen printing machines in a completely manual procedure. Since the founding of PCI, this company has grown rapidly to become the largest ceramic company in Indonesia and a market leader. In Karampilan, Surabaya, PCI has eight factories spread over 27 hectares of land, two factories in Levaniwalas, two factories covering 40 hectares in Gresik, and one factory in Rengas Bandung, Bekasi.

The COPRAS technique is an approach that can be used in decision support systems. Decision Support System (DSS) or Complex Proportional Assessment (COPRAS) techniques attempt to rank options according to positive and negative criteria. This method is widely used to draw conclusions and decisions in various fields (Cipta & Hasugian, 2018). The Copras (Complex Proportional Assessment) method includes preparing the attributes to be identified, matrix normalization, weighted matrix normalization, calculating maximum and minimum index values, calculating relative weights, and quantifying each. The final result is obtained by calculating the quantitative utility of each choice (Tonni, 2020).

Previous research has included a multicriteria analysis approach in various alternative selection contexts, including Product Selection, Provider Selection, and Service Selection. These methods, such as the Analytical Hierarchy Process (AHP), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), and Weighted Sum Model (WSM), help decision-makers in selecting supported alternatives, and have been proven effective. (Mesran et al., 2017).

However, there is still little research that discusses the topic of choosing the best ceramics for the home. Closing this gap by analyzing the selection of the best household ceramics based on relevant factors is the aim of this research. By using a multi-criteria analysis approach, this research will identify and evaluate the most optimal ceramic choices based on established criteria (Siregar et al., 2020). It is hoped that the findings of this research will provide useful direction for companies, architects, designers, and consumers in choosing the best household ceramics, so as to improve the overall quality and aesthetics of the room.

LITERATURE REVIEW

Decision Support Systems

Decision Support System (DSS) is a computer-based interactive system that utilizes data and models to support the decision-making process, especially in resolving situations that do not have a clear structure or are only semi-structured (Turban, Liang, and Aronson, 2005 in Limbong . et al., 2020). In fact, DSS was originally defined as a model-based system consisting of data processing processes and considerations that help managers make decisions. To achieve its goals, the system needs to be simple, easy to control, easy to adapt, and also comprehensive (Limbong, et al. 2020).

Copras Method (Complex Proportional Assessment

The COPRAS (Complex Proportional Assessment) method is a method for making decisions that assume direct and proportional dependence on the level of significance and usefulness of alternatives. This method selects the best decision by considering the best and worst ideal solutions (Mesran et al., 2017).

Zavadskas and Kaklauskas (1996) introduced the COPRAS method, the COPRAS method is a well-known MCDM method that can determine the best solution for a ratio with the worst ideal solution (Valipour, Yahaya, Md Noor, Antuchevičienė, & Tamošaitienė, 2017).

The feature that makes the COPRAS method superior to other methods is that it can be used to calculate alternative utility levels which indicate the level of goodness and badness of an alternative taken for comparison (Chatterjee & Chakraborty, 2013). The COPRAS method has been successfully applied to several problems in the fields of building

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construction and property management (Roy et al., 2019).

The Copras method is a method used to calculate the level of feasibility of alternatives and compare one alternative with another alternative to determine the best alternative with the worst alternative in order to decide on a correct and accurate decision.

Copras has several advantages that can be used in the decision-making process due to a number of factors:

1. This method is transparent, easy to use, and has low calculation time. Therefore, this method can be easily adopted by interested parties.
2. Copras can provide a complete ranking of alternatives.
3. This method can handle quantitative and qualitative criteria in one assessment.
4. Copras has the ability to take into account positive (maximizing) and negative (minimizing) evaluation criteria, which can be assessed separately in the evaluation process.
5. An important feature that makes the Copras method superior to other available methods is that it can be used to estimate the degree of utility of alternatives, showing, as a percentage, the extent to which one alternative is better or worse than another alternative taken for comparison.
6. Furthermore, the Copras method has been frequently and successfully applied to a wide range of property, planning, and sustainability-related problems.

Ceramics

According to Ambar (1997, 1), ceramics is a term that describes a product made from clay, then shaped using certain techniques so that an object is created according to the wishes of the person who formed it. Objects made from clay will be called ceramics after going through a high-temperature firing process, which will give the ceramic maturity. In this case, Ambar Astuti also agrees that ceramics are one of the oldest crafts, these objects are made by the Egyptians on the banks of the Nile, and the emergence of ceramics over the centuries can be traced through artifacts created by nations in other parts of the world, especially the Greeks, the Romans, the Chinese during the Tang and Sung dynasties, the Koreans and also American Indians.

Ceramics comes from the Greek word "Keramos" which means a pot or pot formed using earth. What is meant by ceramic items are items made from earth, and silicate materials and the manufacturing process uses high-temperature firing.

According to R.A. Razak (1987,7) states that in the X century in the Song dynasty porcelain had to be made, pure white and white blue, which is still popular today. In the seventeenth century, ceramic products developed very rapidly both in quantity and quality, so that during the Ming dynasty many of these items, especially white porcelain, were exported to European and Asian countries. At that time, many European and Asian countries imitated the production of objects porcelain.

Best Category in Ceramics

In choosing the best ceramics, some categories determine the best ceramics, namely:

1. Brand

According to Buchory (2010), a brand is a name, term, sign, symbol design or combination of these that is expected to identify goods or services from a group of sellers and is expected to differentiate these goods or services from competing products.

2. Price

According to Kotler and Armstrong in Krisdayanto (2018:3), Price is the amount of money paid for services, or the amount of value that consumers exchange in order to get benefits from owning or using goods or services.

3. Thickness

Thickness is the perpendicular distance between two parallel rock layers. Thickness can be measured either directly or indirectly.

4. Size

Measurement is a way of assessing objects, time, or situations according to certain rules or guidelines.

5. Pattern

The pattern is an arrangement of motifs whether regular, planned, or free.

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METHOD

The type of research used is a quantitative method. Obtained based on data taken from the PT office. Platinum Ceramics Industry(PCI). This research uses secondary data collection as the data source. This information is information that is taken and collected personally by individuals directly from the research site, which is taken and collected in the form of characteristics and criteria for selecting the best household ceramics, in addition to further research data for the author.

This data is data taken and collected by individuals themselves directly from the research site using assessment criteria and criteria weights, in addition to further research data for the author.

Table 1.
Research Variables

Criteria	Information
C1	Price
C2	Thickness
C3	Size
C4	Pattern
C5	Material

The actions (processes) used in this research are:

1. Identifying the selection of household ceramics by conducting research using publications from journals and online sources about this technique, namely the Complex Proportional Assessment (COPRAS) technique (Chatterjee & Chakraborty, 2013).
2. Data collection
   The following are the techniques for collecting research data:
   a. Documentation Result
      In the form of data from documentation of the selection of household ceramics from PT Platinum Ceramics Industries.
3. Data processing
   After all, data is collected using the COPRAS approach, data processing is carried out in stages, namely:
   a. Create an alternative data table or matrix. The results of the first stage will produce a table or matrix that includes every choice and every value based on the specified criteria.
   b. Create a normalized matrix. The results of the next phase will produce a new matrix or table that includes normalized results for each criterion for each possibility
   c. Multiply the weights. After the third stage, a matrix is created containing the results of multiplying the weight values with each normalized criterion
   d. Calculate positive and negative criteria. For each criterion, the results will produce values S_(+1) and S_(-1). When more calculations are completed, these two values will be added to the new table.
   e. Finding out the favorable and unfavorable ratios in relation to each other. For each choice, the results of this fifth stage will produce a Q value. The Q value will be expressed as a decimal.
   f. Determine the level of utility of each option. The result will produce a % for each selection. The alternative percentage value must be equal to 100% because the Qmax value and Q value for the alternative will be the same.
   g. Get ranking findings for the best selection of household ceramics.

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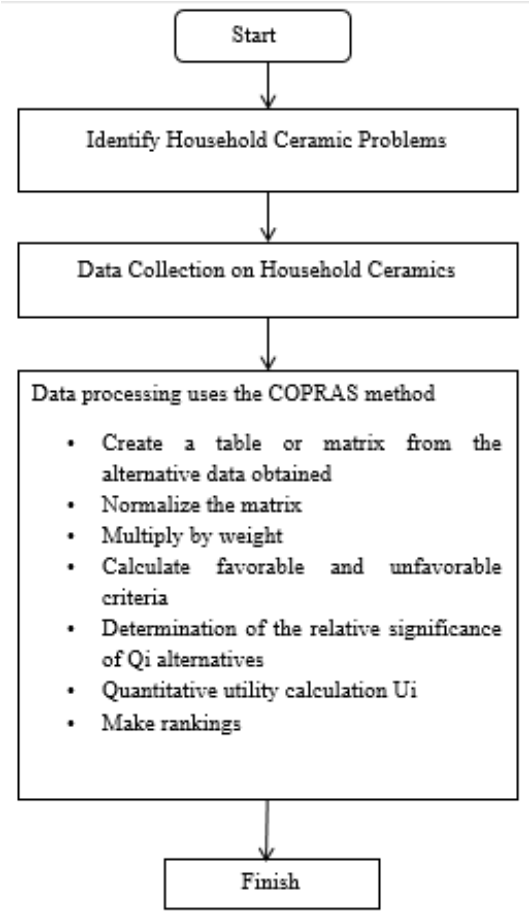

Fig 1. Research Procedure

2. RESULT

Calculation of price, thickness, size, and pattern are the five criteria elements used in this strategy.

Table 2.
Criteria

No	Criteria Code	Criteria Name	Weight	Weight Improvement
1	C1	Harga	5	5/15 = 0,33
2	C2	Ketebalan	3	3/15 = 0,2
3	C3	Ukuran	1	1/15 = 0,07
4	C4	Corak	3	3/15 = 0,2
5	C5	Bahan	3	3/15 = 0,2
	Total		15	1

1. Sub Criteria

The values given to determine the condition are known as sub-criteria. Each criterion may have sub-criteria, which can be arranged numerically to form a hierarchy. The following provides an explanation for the comparison of value scales in sub-criteria.

a. Price

Subcriteria in C1 (price): very expensive, expensive, fair, cheap, and very cheap are some of the categories included in it. The weight values in Table 4.2 below can be modified according to the assigned categories:

Table 3.

* Corresponding author

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Sub-Criteria C1

No	C1	Weight
1	>100.000	5
2	80.000–100.000	4
3	70.000 – 79.0000	3
4	50.000 – 69.0000	2
5	<50.000	1

b. Thickness

There are four sub-thickness requirements for C2: very good, good, fair, poor, and very poor. The weight values in Table 4.3 below can be changed based on the assigned categories:

Table 4.
Sub-Criteria C2

No	C2	Weight
1	14mm	5
2	13mm	4
3	12mm	3
4	11mm	2
5	<11mm	1

c. Size

There are four sub-criteria for measurement in C3: very good, good, fair, and poor. The weight values in Table 4. can be changed based on the predefined categories:

Table 5.
SubCriteria C3

No	C3	Weight
1	>90x90	5
2	90x90	4
3	60x60	3
4	40x40	2
5	30x30	1

d. Pattern

Very good, quite good, sufficient, poor, and very poor are sub-criteria in C4C. The weight value can be changed to 4.5 or below by paying attention to the assigned categories:

Table 6.
SubCriteria C4

No	C4	Weight
1	Luxurious	5
2	Interesting	4
3	Unique	3
4	Normal	2
5	Plain	1

e. Material

Very good, quite good, sufficient, not good, and very poor are the sub-criteria in C5 C. The weight value can be changed to 4.5 or below by paying attention to the categories that have been determined:

Table 7.
SubCriteria C4

* Corresponding author

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No	C5	Weight
1	Clay	5
2	Kaolin	4
3	Sand	3
4	Felspard	2
5	Ball clay	1

f. Alternative

Based on the suppliers of ceramics offered at the Platinum Ceramic Industry Store, data on alternative ceramics was collected. Five alternative data samples were obtained from the Platinum Ceramic Industry Store; Table 8 shows how alternative data is determined.:

Table 8.
Alternatives

Code	Alternatif	C1	C2	C3	C4	C5
A1	Mulia	2	4	3	4	5
A2	Fortuna	3	3	2	5	5
A3	Crystal	4	5	5	5	5
A4	RedHorse	2	2	4	3	5
A5	Prato	5	4	5	4	5
A6	Murano	1	1	2	1	5
A7	Virginia	2	1	3	5	5
A8	Vancouver	2	2	3	5	5

Complex Proportional Assessment Calculation

The COPRAS (Complex Proportional Assessment) approach can be used to solve the problem in the following steps.:

1. Create a Decision Matrix

$$= \begin{bmatrix} 2 & 4 & 3 & 4 & 5 \\ 3 & 3 & 2 & 5 & 5 \\ 4 & 5 & 5 & 5 & 5 \\ 2 & 2 & 4 & 3 & 5 \\ 5 & 4 & 5 & 4 & 5 \\ 1 & 1 & 2 & 1 & 5 \\ 2 & 1 & 3 & 5 & 5 \\ 2 & 2 & 3 & 5 & 5 \end{bmatrix}$$

2.Normalizing Decision Matrices

To normalize a matrix, add the values of each column. To obtain the matrix, divide each possible column value by the total for each column X_{ij}

$$X_{ij} / \sum_{i=1}^{m} X_{ij}$$

Criteria 1 (C1)= (2+3+4+2+5+1+2+2)= 21
A1=2:21 = 0,0952
A2=3:21 = 0,1428
A3=4:21 = 0,1904
A4=2:21 = 0,0952
A5=5:21 = 0,2380
A6=1:21 = 0,0476
A7=2:21 = 0,0952

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A8=2:21 = 0,0952

Criteria 2 (C2)= (4+3+5+2+4+1+1+2)= 22
A1= 4:22 = 0,1818
A2= 3:22 = 0,1363
A3= 5:22 = 0,2272
A4= 2:22 = 0,0909
A5= 4:22 = 0,1818
A6= 1:22 = 0,0454
A7= 1:22 = 0,0454
A8= 2:22 = 0,0909

Criteria 3 (C3)= (3+2+5+4+5+2+3+3)= 27
A1= 3:27 = 0,1111
A2= 2:27 = 0,0740
A3= 5:27 = 0,1851
A4= 4:27 = 0,1481
A5= 5:27 = 0,1851
A6= 2:27 = 0,0740
A7= 3:27 = 0,1111
A8= 3:27 = 0,1111

Criteria 4 (C4)= (4+5+5+3+4+1+5+5)= 32
A1= 4:32 = 0,125
A2= 5:32 = 0,1562
A3= 5:32 = 0,1562
A4= 3:32 = 0,0937
A5= 4:32 = 0,125
A6= 1:32 = 0,0312
A7= 5:32 = 0,1562
A8= 5:32 = 0,1562

Criteria 5 (C5)= (5+5+5+5+5+5+5+5)= 40
A1= 5:40 = 0,1
A2= 5:40 = 0,1
A3= 5:40 = 0,1
A4= 5:40 = 0,1
A5= 5:40 = 0,1
A6= 5:40 = 0,1
A7= 5:40 = 0,1
A8= 5:40 = 0,1

From the calculation above, the matrix Xij is obtained, which is as follows:

$$\begin{bmatrix} 0{,}0952 & 0{,}1818 & 0{,}1111 & 0{,}125 & 0{,}1 \\ 0.1428 & 0{,}1363 & 0{,}0740 & 0{,}1562 & 0{,}1 \\ 0{,}1904 & 0{,}2272 & 0{,}1851 & 0{,}1562 & 0{,}1 \\ 0{,}0952 & 0{,}0909 & 0{,}1481 & 0{,}0937 & 0{,}1 \\ 0{,}2380 & 0{,}1818 & 0{,}1851 & 0{,}125 & 0{,}1 \\ 0{,}0476 & 0{,}0454 & 0{,}0740 & 0{,}0312 & 0{,}1 \\ 0{,}0952 & 0{,}0454 & 0{,}1111 & 0{,}1562 & 0{,}1 \\ 0{,}0952 & 0{,}0909 & 0{,}1111 & 0{,}1562 & 0{,}1 \end{bmatrix}$$

3. Equality Criteria Xij. Wij. Criterion 1 (C1) Weighted Decision Matrix can be used to find the normalized weighted decision matrix.*:*
A1= 0,0952·0,33 = 0,0314

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A2= 0,1875·0,33 = 0,0618
A3= 0,1904·0,33 = 0,0628
A4= 0,0952·0,33 = 0,0314
A5= 0,2380·0,33 = 0,0785
A6= 0,0476·0,33 = 0,0157
A7= 0,0952·0,33 = 0,0314
A8= 0,0952·0,33 = 0,0314

Criterion 2 Weighted Decision Matrix (C2):
A1= 0,1818·0,2 = 0,0363
A2= 0,1363·0,2 = 0,0272
A3= 0,2272·0,2 = 0,0454
A4= 0,0909·0,2 = 0,0181
A5= 0,1818·0,2 = 0,0363
A6= 0,0454·0,2 = 0,0090
A7= 0,0454·0,2 = 0,0090
A8= 0,0909·0,2 = 0,0181

Criterion 3 Weighted Decision Matrix (C3):
A1= 0,1111·0,07 = 0,0077
A2= 0,0740·0,07 = 0,0051
A3= 0,1851·0,07 = 0,0129
A4= 0,1481·0,07 = 0,0103
A5= 0,1851·0,07 = 0,0129
A6= 0,0740·0,07 = 0,0051
A7= 0,1111·0,07 = 0,0077
A8= 0,1111·0,07 = 0,0077

Criterion Weighted Decision Matrix 4 (C4):
A1= 0,125·0,2 = 0,025
A2= 0,1562·0,2 = 0,0312
A3= 0,1562·0,2 = 0,0312
A4= 0,0937·0,2 = 0,0937
A5= 0,125·0,2 = 0,025
A6= 0,0312·0,2 = 0,0062
A7= 0,1562·0,2 = 0,0312
A8= 0,1562·0,2 = 0,0312

Criterion 5 Weighted Decision Matrix (C5):
A1= 0,1·0,2 = 0,02
A2= 0,1·0,2 = 0,02
A3= 0,1·0,2 = 0,02
A4= 0,1·0,2 = 0,02
A5= 0,1·0,2 = 0,02
A6= 0,1·0,2 = 0,02
A7= 0,1·0,2 = 0,02
A8= 0,1·0,2 = 0,02
The matrix can be obtained using the given calculations. D_{ij}

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$$D_{ij} = \begin{bmatrix} 0{,}0314 & 0{,}0363 & 0{,}0077 & 0{,}025 & 0{,}02 \\ 0{,}0618 & 0{,}0272 & 0{,}0051 & 0{,}0312 & 0{,}02 \\ 0{,}0628 & 0{,}0454 & 0{,}0129 & 0{,}0312 & 0{,}02 \\ 0{,}0314 & 0{,}0181 & 0{,}0103 & 0{,}0937 & 0{,}02 \\ 0{,}0785 & 0{,}0363 & 0{,}0129 & 0{,}025 & 0{,}02 \\ 0{,}0157 & 0{,}0090 & 0{,}0051 & 0{,}0062 & 0{,}02 \\ 0{,}0314 & 0{,}0090 & 0{,}0077 & 0{,}0312 & 0{,}02 \\ 0{,}0314 & 0{,}0181 & 0{,}0777 & 0{,}0312 & 0{,}02 \end{bmatrix}$$

4. Make calculations of positive and negative criteria.

S_{+1}= (C1+C2+C4+C5)
A1 = 0,0314+0,0363+0,025+0,02 = 0,2927
A2 = 0,0618+0,0272+0,0312+0,02 = 0,3202
A3 = 0,0628+0,0454+0,0312+0,02 = 0,3394
A4 = 0,0314+0,0181+0,0937+0,02 = 0,3432
A5 = 0,0785 +0,0363+0,025+0,02 = 0,3398
A6 = 0,0157+0,0090+0,0062+0,02 = 0,2867
A7 = 0,0314+0,0090+0,0312+0,02 = 0,2716
A8 = 0,0314+0,0181+0,0312+0,02 = 0,2807
S_{-i}= C3
A1 = 0,0077
A2 = 0,0051
A3 = 0,0129
A4 = 0,0103
A5 = 0,0129
A6 = 0,0051
A7 = 0,0077
A8 = 0,0077
Total from S_{-i} = 0,1855.

5. Determination of each relative weight

Table 9.
Determination of the relative weight of each option

S_{-i}	S_{-i} · total dari 1/ S_{-i}
$\frac{1}{0{,}0077}$ = 129,8701	0,0077· 1.033,893 = 7,9609
$\frac{1}{0{,}0051}$ = 196,0784	0,0051 · 1.033,893 = 5,2728
$\frac{1}{0{,}0129}$ = 77,5193	0,0129 · 1.033,893 = 13,3372
$\frac{1}{0{,}0103}$ = 97,0873	0,0103 · 1.033,893 = 10,6490
$\frac{1}{0{,}0129}$ = 77,5193	0,0129 · 1.033,893 = 13,3372
$\frac{1}{0{,}0051}$ = 196,0784	0,0051· 1.033,893 = 5,2728
$\frac{1}{0{,}0077}$ = 129,8701	0,0077· 1.033,893 = 7,9609
$\frac{1}{0{,}0077}$ = 129,8701	0,0077· 1.033,893 = 7,9609
Total = 1.033,893	

Q1 = $0{,}2927+\frac{0{,}1855}{7{,}9609}$ = 0,2927 + 0,0233 = 0,316
Q2 = $0{,}3202+\frac{0{,}1855}{5{,}2728}$ = 0,3202 + 0,0351 = 0,3553
Q3 = $0{,}3394+\frac{0{,}1855}{13{,}3372}$ = 0,3394 + 0,0139 = 0,3533

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Q4 = 0,3432+$\frac{0,1855}{10,6490}$ = 0,3432 + 0,0174 = 0,3579
Q5 = 0,3398+$\frac{0,1855}{13,3372}$ = 0,3398 + 0,0139 = 0,3537
Q6 = 0,2867+$\frac{0,1855}{10,6490}$ = 0,2867 + 0,0174 = 0,3041
Q7 = 0,2716+$\frac{0,1855}{13,3372}$ = 0,2716 + 0,0139 = 0,2855
Q8 = 0,2807+$\frac{0,1855}{5,2728}$ = 0,2807 + 0,0351 = 0,3158
Max Q_i = 0,3579

6. Calculate the utility (Ui) of each option

Ui = $\left[\frac{Q_i}{Q_{max}}\right]$x 100%
U1 = $\left[\frac{0,316}{0,3579}\right]$x 100% = 88,30
U2 = $\left[\frac{0,3553}{0,3579}\right]$x 100% = 99,27
U3 = $\left[\frac{0,3533}{0,3579}\right]$x 100% = 98,71
U4 = $\left[\frac{0,3579}{0,3579}\right]$x 100% = 100
U5 = $\left[\frac{0,3537}{0,3579}\right]$x 100% = 98,82
U6 = $\left[\frac{0,3041}{0,3579}\right]$x 100% = 84,97
U7 = $\left[\frac{0,2855}{0,3579}\right]$x 100% = 79,77
U8 = $\left[\frac{0,3158}{0,3579}\right]$x 100% = 88,24

The ranking is carried out based on the results of calculations made using the Complex Proportional Assessment (COPRAS) approach mentioned above.

Table 10. Alternative Ranking

No	Code	Ceramic Brand	Ui	Rating
1	A1	Mulia	88,30	5
2	A2	Fortuna	99,27	2
3	A3	Crystal	98,71	4
4	A4	Redhorse	100	1
5	A5	Prato	98,82	3
6	A6	Murano	84,97	7
7	A7	Virginia	79,77	8
8	A8	Vancouver	88,24	6

DISCUSSIONS

Based on the problem formulation that has been stated previously and after conducting research, the conclusion of this research is that the complex proportional assessment (complex) method can be used to obtain results from selecting the best household ceramics at PT. Platinum Ceramics Industries and can help consumers in choosing the best household ceramics based on consumer desires.

CONCLUSION

Based on the problem formulation that has been stated previously and after conducting research, the conclusion of this research is that the complex proportional assessment (complex) method can be used to obtain results from selecting the best household ceramics at PT. Platinum Ceramics Industries and can help consumers in choosing the best household ceramics based on consumer desires.

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