# Design Product Parameters for Customer Needs on Mineral Water Packaging from The Prespective of A Product Design

**Ribangun Bamban Jakaria[1]\*, Iswanto[2], and Nur Haizal binti Mat Yaakop Arifin[3]**
Industrial Engineering, Faculty of Science and Technology, Universitas Muhammadiyah Sidoarjo, Sidoarjo, Indonesia[1]
Mechanical Engineering, Faculty of Science and Technology, Universitas Muhammadiyah Sidoarjo, Sidoarjo, Indonesia[2]
Faculty of Design, Innovation and Technology Sultan Zainal Abidin University Kuala Terengganu Malaysia[1,3]
**\*ribangunbz@umsida.ac.id**

*Abstract*
*Suli 5 Mineral Water is a bottled drinking water product founded by the Muhammadiyah Regional Leadership Economic and Entrepreneurship Council Tuban, East Java in establishing the Suli 5 Bottled Drinking Water company which is a franchise of PT. Suryatama Cemerlang Abadi as Suli's holding company 5. The use of Suli drinking water in all business charities has not yet shown a positive trend. This research aims to identify consumer preferences for drinking water packaging product design as a recommendation for marketing and manufacturing policies. The research method used is the Traditional conjoint method which is used to measure the utility value and relative importance of each bottled water product design attribute to determine consumer preferences for these attributes. The sample chosen was a non-probability sampling, namely using a judgment sampling technique. The results of this research are that product parameters consist of product performance, features, reliability, suitability, durability, service capability, quality impression (perception), aesthetics, and product packaging so using combined analysis provides quantitative information so that consumer preference modeling in producing a combination of features in the design of 600 ml suli packaging products with the highest level of interest is Product Performance, with 18,380, followed by features, with 15,093; Perceived Quality, at 12,604; Reliability, at 10,682; Product Packaging, at 10,344; Ease of Service, at 8,958; aesthetics, at 8,552, Durability, at 8,099, and finally Suitability, at 7,289.*

**Keywords**: *Design Product, the Bottle Drinking Water, Conjoint Method.*

*Abstrak*
*Air Mineral Suli 5 merupakan produk air minum dalam kemasan yang didirikan oleh Majelis Ekonomi dan*

*Kewirausahaan Pimpinan Daerah Muhammadiyah Tuban (MEK_PDM) Tuban Jawa Timur dalam mendirikan perusahaan Air Minum Dalam Kemasan Suli 5 yang merupakan waralaba dari PT. Suryatama Cemerlang Abadi (SCA) sebagai holding company Suli 5. Pemanfaatan air minum Suli di seluruh badan usaha belum menunjukkan tren yang positif. Permasalahan ini penting untuk diteliti karena persediaan air minum memiliki potensi untuk tumbuh dan berkembang. Tujuan dari penelitian ini adalah untuk mengidentifikasi preferensi konsumen terhadap desain produk air minum dalam kemasan sebagai bahan rekomendasi pemasaran dan pembuatan kebijakan. Metode penelitian yang digunakan adalah metode Conjoint yang digunakan untuk mengukur nilai kegunaan dan kepentingan relatif setiap atribut desain produk air minum dalam kemasan untuk mengetahui preferensi konsumen terhadap atribut tersebut. Sampel yang dipilih adalah non-probability sampling yaitu menggunakan teknik judgement sampling. Hasil penelitian ini adalah parameter produk terdiri dari kinerja produk, fitur, keandalan, kesesuaian, daya tahan, kemampuan layanan, kesan kualitas (persepsi), estetika, kemasan produk, sehingga dengan menggunakan analisis konjoin memberikan informasi kuantitatif sehingga dapat dilakukan pemodelan preferensi konsumen dalam menghasilkan kombinasi fitur pada desain produk kemasan suli 600 ml.*

**Keywords:** *Desain Produk, Air Minum dalam Minum, Metode Konjoin.*

## 1. Introduction

Good products in marketing practices require a deep understanding of customer needs (Jakaria & Sukmono, 2021). So, in marketing strategy, the customer needs to help segment the market, identify strategic dimensions for differentiation, and make efficient channel management decisions (Timoshenko & Hauser, 2019). This correlates with product development because customers need to identify new product opportunities (Ibrahim, 2013), improve new product designs (Jakaria & Sukmono, 2021; Krishnan & Ulrich, 2001; Ulrich, 2016), help manage product portfolios, and improve existing products and services (Kim et al., 2017). In marketing research, customers need help identifying attributes used in conjoint analysis (Mandloi, 2022). The business charity owned by (Sasongko, 2015) has the opportunity to create drinking water packaging products that are managed professionally and can meet the needs of all citizens and the Muhammadiyah Business Charity.

So, the efforts of the Muhammadiyah Regional Leadership Economic and Entrepreneurship Council Tuban, East Java, in establishing the Suli 5 Bottled Drinking Water company, PT franchise. Suryatama Cemerlang Abadi (SCA), as the Suli 5 holding company, has the opportunity to become an ideal business role model for Muhammadiyah business development (Sasongko, 2015). However, since its founding until now the trend of sales and use of these packaging products in the number of Muhammadiyah charities has not shown a positive trend,

even though several regional leaders have set up factories, for example, in PDM North Sumatra (Alamsyah, 2017a), PDM Solo Raya (Alamsyah, 2017b).

As efforts to develop bottled drinking water products, express needs, and transfer needs into accurate product specifications need to be done, this is because customers do not have the necessary expertise regarding products they are not familiar with and have difficulty in expressing their intentions and needs (Wang et al., 2018).

In several studies, product development uses various methods, such as applying quality functions, to identify customer solutions or product attributes that meet customer needs (Timoshenko & Hauser, 2019). The following research reviewed 650 research articles that developed, refined, and implemented the Implementation of Quality Functions to map customer needs for solutions(Alajhar et al., 2022). Meanwhile, other research reviews the use of customer needs in fuzzy front ends, product design, product testing, and product launches(Li et al., 2021). Customer needs can also be used to identify attributes for conjoint analysis (Steiner et al., 2016). Other research proposes a benefits-based conjoint analysis model that maps product attributes to customers' latent needs before estimating (Kim et al., 2017b)

While the SDGs approach and data availability are important in supporting the implementation of this research, it refers to goal 6, which is to ensure the availability and sustainable management of water and sanitation. by ensuring universal access to water resources and sanitation for all everywhere by providing universal access to safe drinking water at home and in schools.(Sutopo et al., 2014), the data source was obtained through data from BPS East Java regarding the amount of need and availability of drinking water (BPS East Java, 2022).

## 2. Method

The data analysis method applied in this study is conjoint analysis. The selection of 600 ml packaging as the research object is based on the market size consumers often choose because it is practical and easy to carry. Conjoint analysis functions to understand how someone views an object, which consists of several components. This method is used to identify consumer preferences for the design of 600 ml drinking water packaging.

Determining the sample means that the conjoint analysis of the considered sample size ranges from fifty to two hundred (Al-Omari et al., 2022). based on the following formula (Jakaria, 2024) :

Minimum number of samples = [(Number of levels - Number of attributes) + 1] x 5 (1)

The number of levels and attributes used in this study is 4 levels and 12 attributes, so based on formula number one, the number of samples in this study is 45.

Conjoint Analysis Steps:
a. Define Attributes and Then Select The Attribute Levels

Table 1. Define Attributes

| Variables | Attributes/Indicators | Level of Attribute/Sub-Indicator |
|---|---|---|
| Consumer preferences for mineral water packaging design | Product Performance | 1. Effectiveness<br>2. Efficiency |

| Variables | Attributes/Indicators | Level of Attribute/Sub-Indicator |
|---|---|---|
| | | 3. Speed in Carrying Out Functions Product |
| | Feature | 1. Additional Capabilities |
| | | 2. Innovation |
| | | 3. Uniqueness. |
| | Reliability | 1. Consistency |
| | | 2. Durability. |
| | Suitability | 1. Conformity to Specifications |
| | | 2. User needs |
| | Durability | 1. Resistance to damage |
| | | 2. Usage age |
| | Service Capability | 1. Responsiveness |
| | | 2. Quality After Sales Service |
| | Impression of Quality (Perception) | 1. Brand image |
| | | 2. User Experience |
| | Aesthetics | 1. Visual Design |
| | | 2. Product Attractiveness |
| | Product Packaging | 1. Function |
| | | 2. Information |
| | | 3. Attractive Packaging |

b. Stimulus Design

The way to combine them is to multiply the number of attributes by the number of attribute levels. If the number of attributes in this research is 4, and each attribute consists of 4, 3, 3, and 2, then the possible combinations are 3x3x2x2x2x2x2x2x3 = 1728.

Table 2. Stimulus Design

| Product Performance | Feature | Reliability | Suitability | Durability | Service Capability | Impression Of Quality (Perception) | Aesthetics | Product Packaging | Card |
|---|---|---|---|---|---|---|---|---|---|
| Speed In Carrying Out Product Functions | Innovation | Consistency | Conformity To Specifications | Usage Age | Responsiveness | User Experience | Product Attractiveness | Information | 1 |
| Effectiveness | Uniqueness | Consistency | Conformity To Specifications | Resistance To Damage | Quality After-Sales Service | User Experience | Visual Design | Information | 2 |
| Efficiency | Innovation | Durability | User Needs | Resistance To Damage | Quality After-Sales Service | User Experience | Visual Design | Function | 3 |
| Speed In Carrying Out Product Functions | Additional Capabilities | Consistency | User Needs | Usage Age | Quality After-Sales Service | User Experience | Visual Design | Function | 4 |
| Efficiency | Uniqueness | Consistency | User Needs | Usage Age | Responsiveness | Brand Image | Visual Design | Information | 5 |
| Effectiveness | Additional Capabilities | Durability | User Needs | Usage Age | Quality After Sales Service | Brand Image | Product Attractiveness | Information | 6 |
| Speed In Carrying Out Product Functions | Uniqueness | Durability | Conformity To Specifications | Resistance To Damage | Quality After Sales Service | Brand Image | Product Attractiveness | Function | 7 |
| Effectiveness | Additional Capabilities | Consistency | Conformity To Specifications | Resistance To Damage | Responsiveness | Brand Image | Visual Design | Function | 8 |
| Speed In Carrying Out Product Functions | Additional Capabilities | Durability | User Needs | Resistance To Damage | Responsiveness | Brand Image | Visual Design | Information | 9 |

| Product Performance | Feature | Reliability | Suitability | Durability | Service Capability | Impression Of Quality (Perception) | Aesthetics | Product Packaging | Card |
|---|---|---|---|---|---|---|---|---|---|
| Effectiveness | Innovation | Consistency | User Needs | Resistance To Damage | Quality After Sales Service | Brand Image | Product Attractiveness | Information | 10 |
| Effectiveness | Uniqueness | Durability | User Needs | Usage Age | Responsiveness | User Experience | Product Attractiveness | Function | 11 |
| Efficiency | Additional Capabilities | Durability | Conformity To Specifications | Resistance To Damage | Responsiveness | User Experience | Product Attractiveness | Information | 12 |
| Effectiveness | Additional Capabilities | Consistency | User Needs | Resistance To Damage | Responsiveness | User Experience | Product Attractiveness | Function | 13 |
| Effectiveness | Innovation | Durability | Conformity To Specifications | Usage Age | Responsiveness | Brand Image | Visual Design | Function | 14 |
| Efficiency | Additional Capabilities | Consistency | Conformity To Specifications | Usage Age | Quality After-Sales Service | Brand Image | Product Attractiveness | Function | 15 |
| Effectiveness | Additional Capabilities | Durability | Conformity To Specifications | Usage Age | Quality After-Sales Service | User Experience | Visual Design | Information | 16 |

c. Collecting respondents' opinions on each stimulus

The list of stimuli obtained from the SPSS processing is used then as a basis for compiling the questionnaire, which is given to the respondent to fill in, weighting each stimulus present with a value from 1 to 5, from the worst to the best.

d. Perform The Conjoint Technique

After stage 3, which is to gather the opinions of the respondents, the next step is to carry out a conjoint analysis, which involves estimating the shape of the product based on the respondents' wishes.

e. Determine Predictive Accuracy

After the conjoint analysis results are known, the next step is to conduct a simulation validity test to determine the alignment between the sample and the population. The validity test is carried out using Kendall's Tau and Pearson's R correlations(Tugiman et al., 2022), with the following conditions

a) H0 indicates that the observed variable and the estimated preferences do not have a strong relationship.

b) H1 indicates that there is a strong relationship between the observed variable and the estimated preferences.

with the following conditions:

H0 is accepted if the significance value is $\geq 0.05$.

H0 is rejected when the significant value is $< 0.05$. (Ihwah, 2020); (Felayana Isfar, 2020)

## 3. Result and Discussion

3.1  Result

a.  Utility Analysis

The following are the Table 3. Utility Analysis results for all respondents:

Table 3. Utility Analysis

**Utilities**

| | | Utility Estimate | Std. Error |
|---|---|---|---|
| Product Performance | Effectiveness | -,058 | ,059 |

**Utilities**

|  |  | Utility Estimate | Std. Error |
|---|---|---|---|
|  | Efficiency | ,025 | ,069 |
|  | Speed in carrying out product functions | ,032 | ,069 |
| Feature | Additional capabilities | -,076 | ,059 |
|  | Innovation | ,014 | ,069 |
|  | Uniqueness | ,063 | ,069 |
| Reliability | Consistency | ,036 | ,044 |
|  | Durability | -,036 | ,044 |
| Suitability | Conformity to specifications | -,005 | ,044 |
|  | User needs | ,005 | ,044 |
| Durability | Resistance to damage | ,005 | ,044 |
|  | Usage age | -,005 | ,044 |
| Serviceability | Responsiveness | -,026 | ,044 |
|  | Quality after sales service | ,026 | ,044 |
| Impression Quality | Brand image | -,071 | ,044 |
|  | User experience | ,071 | ,044 |
| Aesthetics | Visual design | -,016 | ,044 |
|  | Product attractiveness | ,016 | ,044 |
| Product Packaging | Function | -,064 | ,044 |
|  | Information | ,064 | ,044 |
| (Constant) |  | 3,959 | ,049 |

Table 3 describes that the utilities analysis results of this test are useful clip-on recorders, giving an idea about which attributes have more effect on consumer choice when they choose mineral water. The uniqueness, user experience and quality after sales service have a positive impact on consumer adoption but attributes such as effectiveness or brand image do not influence the decision to adopt significantly if at all. So, these outcomes should be taken into use by marketers and product designers to optimize greater effective product design and marketing strategies.

b.  Importance Values

The Importance Values output provides the most important or least important results on the attribute/attribute level relationship, as shown in the following Table 4.

Table 4. Importance Values

**Importance Values**

| | |
|---|---|
| Product Performance | 18,380 |
| Feature | 15,093 |
| Reliability | 10,682 |
| Suitability | 7,289 |
| Durability | 8,099 |
| Service Capabilities | 8,958 |
| Impression Quality | 12,604 |

| Importance Values | |
|---|---|
| Aesthetics | 8,552 |
| Product Packaging | 10,344 |

Table 4 explains, that among the attributes derived from available information, the highest value is shown by Product Performance, which has a value of 18,380. This means that the most critical factor attracting the consumer's attention and affecting the decision to purchase is product performance, which is consistent with the fact that, product performance is most often the first factor that consumers pay attention to when choosing a product. Further, the values of feature and impression quality attributes are also high, amounting to 15,093 and 12,604, respectively, which means that the features of the product and the quality of the impression captured are important in creating consumer trust and interest.

This is also confirmed by the work of Gravetter and Wallnau, who say that an attractive product image can make a positive consumer experience (Gravetter & Wallnau, 2014)On the other hand, the Suitability and Aesthetics attributes have lower values, -7,289 and 8,552, respectively. This indicates that although these factors are essential, they are not as high priority as other attributes in influencing the comfort of the consumer's eyesight and cognitive response. Thus, it can be concluded that they need to be balanced most during advertising design.

c. Predictive Measures and Significance Tests (Correlations)

Table 5. Predictive Measures

| Correlations ᵃ | | |
|---|---|---|
| | Value | Sig. |
| Pearson's R | ,828 | ,000 |
| Kendall's knows | ,553 | ,002 |

a. Correlations between observed and estimated preferences

Table 5 describes the results of one such correlation test on how well-observed preferences correlate with utility-based predicted preferences. As can be seen, two kinds of correlation coefficients are reported: Pearson's R and Kendalls Tau. Results explained in detail:

a) Pearson's R

Table 6. Predictive Measures Pearson's R

| Correlations ᵃ | | |
|---|---|---|
| | Value | Sig. |
| Pearson's R | ,828 | ,000 |

The Pearson correlation coefficient, which is a value of 0.828, shows a very strong positive linear relationship between what people reported as their preferences and estimates predicted by our model; in general, precincts with the highest values for actual rankings are also amongst those where scores were overpriced. Here, the value is almost 1, meaning if observed preferences increase, predicted preferences also increase significantly. That is, the estimation

model employed in this study has a high ability to predict consumer preferences for product attributes.

b) Kendall's Tau

Table 7. Predictive Measures Pearson's R

**Correlations ᵃ**

|                    | Value | Sig.  |
|--------------------|------:|------:|
| Kendall's knows    | ,553  | ,002  |

While not as high as Pearson's R, 0.553 is still a pretty good relationship. Kendall's Tau is more resistant to outliers and better for use in ordinal data, so this test will also provide another angle of the strength between the two variables. This relationship is also significant, with a p-value of 0.002, which is much smaller to justify the alternative hypothesis that the model takes care of positive (or negative) autocorrelation up to 2 steps in order against the null directory. Suppose the probability is less than ($p < 0.05$). In that case, there is evidence supporting that it must reject the null hypothesis, which confirms that the results are not a chance occurrence and shows that the model used for estimation is reliable.

3.2  Discussion

The correlation output shows that the correlation coefficients using Pearson's R and Kendall's tau methods show high values of 0.828 and 0.553 with a significance below 0.05. This shows that the accuracy of the 16 predictions for 45 respondents is good and acceptable for describing correlations between observed and estimated preferences.

The correlation output shows that the correlation coefficients using Pearson's R and Kendall's tau methods show high values of 0.828 and 0.553 with a significance below 0.05. This indicates that the accuracy of the 16 predictions for 45 respondents is good and acceptable for describing correlations between observed and estimated preferences.

## 4.  Conclusion

Based on the research and discussion results, it can be concluded that the customer's preference for the design of mineral water product packaging is Product Performance, Features, Reliability, Conformity, Durability, Serviceability, Perceived Quality, Aesthetics, and Product Packaging.

The highest level of interest is Product Performance, with 18,380, followed by features, with 15,093; Perceived Quality, at 12,604; Reliability, at 10,682; Product Packaging, at 10,344; Serviceability, at 8,958; aesthetics, at 8,552, Durability, at 8,099, and finally Conformity, at 7,289. A high and significant correlation value is obtained in the correlation output to measure the prediction accuracy.

## Appreciation

## REFERENCES

Alajhar, N. A., Almiqbel, E., Alamoudi, L., Mashat, R., & Husain, K. (2022). Implementing Quality Management Tools to Improve Customer's Journey at Café. *Open Journal of Business and Management*, *10*(04), 2045–2090. https://doi.org/10.4236/ojbm.2022.104105

Alamsyah, I. E. (2017a). Muhammadiyah Tuban Dirikan Pabrik Suli 5. *REPUBLIKA.CO.ID*. https://news.republika.co.id/berita/ovgcna349/muhammadiyah-tuban-dirikan-pabrik-suli-5

Alamsyah, I. E. (2017b). SULI 5 Ekspansi Bisnis di Solo Raya. *REPUBLIKA.CO.ID*. https://news.republika.co.id/berita/ow4gez349/suli-5-ekspansi-bisnis-di-solo-raya

Al-Omari, B., Farhat, J., & Ershaid, M. (2022). Conjoint Analysis: A Research Method to Study Patients' Preferences and Personalize Care. *Journal of Personalized Medicine*, *12*(2), 274. https://doi.org/10.3390/jpm12020274

BPS East Java. (2022). *Persentase Rumah Tangga yang Memiliki Akses Terhadap Sumber Air Minum Layak Menurut Kabupaten/Kota di Provinsi Jawa Timur, 2016-2021.* https://jatim.bps.go.id/statictable/2022/10/27/2372/persentase-rumah-tangga-yang-memiliki-akses-terhadap-sumber-air-minum-layak-menurut-kabupaten-kota-di-provinsi-jawa-timur-2016-2021.html

Felayana Isfar,. (2020). Analisis Konjoin untuk Mengidentifikasi Preferensi Konsumen terhadap Busana Pesta di Butik Fenny Chen. *Fashion And Fashion Education Journal*, *9*(1).

Gravetter, F. J., & Wallnau, L. B. (2014). *Essentials of Statistics for the Behavioral Sciences.* (8th Edition). Wadsworth.

Ibrahim, M. (2013). *Reka Bentuk Produk*. Dewan Bahasa dan Pustaka.

Ihwah, A. (2020). Analysis of consumers' preference on taro-flavored UHT Ultra milk using conjoint method in Malang City. *Advances in Food Science, Sustainable Agriculture and Agroindustrial Engineering*, *3*(2), 91–100. https://doi.org/10.21776/ub.afssaae.2020.003.02.7

Jakaria, R. B. (2024). *Analysis of Consumer Preferences on Mineral Water Packaging from The Perspective of a Product Design. 10*(1).

Jakaria, R. B., & Sukmono, T. (2021). *Buku Ajar Mata Kuliah Perencanaan Dan Perancangan Produk*. Umsida Press. https://doi.org/10.21070/2021/978-623-6292-41-9

Kim, D. S., Bailey, R. A., Hardt, N., & Allenby, G. M. (2017). Benefit-Based Conjoint Analysis. *Marketing Science*, *36*(1), 54–69. https://doi.org/10.1287/mksc.2016.1003

Krishnan, V., & Ulrich, K. T. (2001). Product Development Decisions: A Review of the Literature. *Management Science*, *47*(1), 1–21. https://doi.org/10.1287/mnsc.47.1.1.10668

Li, S. M., Chan, F. T. S., Tsang, Y. P., & Lam, H. Y. (2021). New Product Idea Selection in the Fuzzy Front End of Innovation: A Fuzzy Best-Worst Method and Group Decision-Making Process. *Mathematics*, *9*(4), 337. https://doi.org/10.3390/math9040337

Mandloi, A. (2022). Conjoint Analysis and its Applications in Marketing Research. *International Journal of Mathematics Trends and Technology*, *68*(3), 43–44. https://doi.org/10.14445/22315373/IJMTT-V68I3P508

Sasongko, A. (2015). *Badan Amal Usaha Muhammadiyah Terus Berkembang*. https://khazanah.republika.co.id/berita/nojpa2/badan-amal-usaha-muhammadiyah-terus-berkembang

Steiner, M., Helm, R., & Maack, V. H. (2016). A customer-based approach for selecting attributes and levels for preference measurement and new product development. *International Journal of Product Development*, *21*(4), 233. https://doi.org/10.1504/IJPD.2016.080308

Sutopo, A., Arthati, D. F., & Rahmi, U. A. (2014). *Kajian Indikator Sustainable Development Goals (SDGs)*. Badan Pusat Statistik.

Timoshenko, A., & Hauser, J. R. (2019). Identifying Customer Needs from User-Generated Content. *Marketing Science*, *38*(1), 1–20. https://doi.org/10.1287/mksc.2018.1123

Tugiman, T., Herman, H., & Yudhana, A. (2022). Uji Validitas Dan Reliabilitas Kuesioner Model Utaut Untuk Evaluasi Sistem Pendaftaran Online Rumah Sakit. *JATISI (Jurnal Teknik Informatika dan Sistem Informasi)*, *9*(2), 1621–1630. https://doi.org/10.35957/jatisi.v9i2.2227

Ulrich, K. T. (2016). *Product Design and Development* (6th ed.). McGraw-Hill, New York.

Wang, Y., Mo, D. Y., & Tseng, M. M. (2018). Mapping customer needs to design parameters in the front end of product design by applying deep learning. *CIRP Annals*, *67*(1), 145–148. https://doi.org/10.1016/j.cirp.2018.04.018