

Analysis of Product Development in SMEs “Monity Jaya Bersama” with The Analytical Hierarchy Process (AHP) Method

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Abstract

The purpose of this research is to obtain a decision for the priority of the product to be developed SMEs with the AHP method. The method used in this study in determining the appropriate product to be developed for the products of SMEs Monity Jaya Bersama is the Analytical Hierarchy Process (AHP). AHP is used to determine the weight of the 4 criteria, namely taste, price, quality and packaging. Meanwhile, alternative product rankings from UKM are original flavor, mocha flavor and extra spicy flavor. Respondents in the AHP method are determined based on the criteria of expertise and involvement in product development activities, from the results of data processing the weights generated from each criterion are Taste 0.30%, Price 0.10%, Quality 0.40% and packaging 0.19%. The conclusion of this study is quality is the first rank following taste, price and quality.

Key words: product development, AHP, rankings, taste, price, quality and packaging

INTRODUCTION

The development of SMEs in Indonesia is one of the priorities in national economic development (Wulansari *et al.*, 2017). At this time, SMEs have a very important role in the progress of the economy in Indonesia where SMEs have quite good capabilities. The existence of competition in the business world makes every company required to be able to analyze and be able to understand what consumers want that is happening in the market. In SMEs, creativity and innovation are needed in its development, therefore the right strategy is needed.

Makassar City is the Capital of South Sulawesi Province, has a number umkm which is relatively large. Where is the increase in the number of umkm in the city of Makassar of course, it cannot be separated from the role of the government to develop

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IJBQR, Volume 01 Issue 01, 2023



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the potential of SMEs There is. One of the SMEs in Makassar is "Monity Jaya Bersama" this UKM founded by Mr. Zukri which is located on Kassi Kassi village, sub-district Rappocini. This UKM produces this type of beverage business with several variants, namely original ginger sukma, mocca ginger sukma, extra spicy ginger sukma and powdered palm sugar, using the basic ingredients of selected quality ginger the best marketing context of this product is still local with scope Its products include Makassar, Malang, Semarang, Banten, Bekasi, Balikpapan, Samarinda, Jayapura, Sorong and Merauke.

Factors from innovative products and good packaging design make a new trend in the beverage product market with several choices flavor variants. With the existence of ideas or innovations carried out by UKM Monity Jaya together with the traditional drink model to produce a product new product in the form of powdered ginger sarabba drink. The success of UKM Monity Jaya Together in entering the traditional market is not far from development efforts products made by UKM Monity Jaya Bersama.

Along with the increasing number of competitors, this business must analyze and formulate a strategy to achieve dynamic goals by it is necessary apply analysis and development strategies that can support business development in order to be able to compete in the world of industry and maintain the continuity of the company. The analytical method used is Analytical Hierarchy Process (AHP).

LITERATURE ANALYSIS AND METHODOLOGY

The analytical hierarchy process is a method of a decision support system that can be used to assist in making decisions in accordance with predetermined criteria and conditions, and these criteria or conditions can be in various forms (Mahendra & Ariyanto, 2018). This method is also used to test consistency through consistency tests through rating scales. This method focuses on prioritizing selection criteria, and distinguishing criteria that are more important from those that are less important (Aziz et al., 2016). The advantage of AHP is that it can provide a rational framework for structuring decision-making problems, while the weakness of AHP is the dependence of the AHP model and its input and the AHP method is only a mathematical method without any systematic testing (Retnoningsih et al., 2016).

According to Warmansyah, J (2010), in the AHP method, there are 4 axioms that underlie the thinking and analytical concepts in it, namely:

1. Reciprocal comparison, which means that the paired comparison matrix formed must be the opposite. For example, if A is k more important than B Then B is $1/k$ times more important than A.

2. Homogeneity, implies similarity in making comparisons. For example, it's impossible to compare an orange to a tennis ball in taste, but it's more relevant in terms of weight.
3. Dependence, meaning that each level has a relationship (Complete hierarchy) although there may be an imperfect relationship (Incomplete hierarchy).
4. Expectation, which means highlighting expectations and preferences of decision making. Assessment can be both quantitative and qualitative data.

The hierarchical method stated by Saaty is a functional hierarchical model with the main input being human perception (Kusrini, 2007). Basically the steps for making decisions in the AHP method include:

1. Define the problem and determine the desired solution.
2. Create a hierarchical structure starting with general objectives, followed by sub-objectives, criteria and possible alternatives at the lowest level of criteria.
3. Create a pairwise comparison matrix that describes the relative contribution or influence or influence of each element on each objective or short criteria above it. Comparisons are made based on "judgment" of decision making by assessing the level of importance of an element compared to other elements.

Basic Principles of Analytical Hierarchy Process (AHP)

In solving problems with the AHP Method, there are several basic principles that must be understood:

1. Decomposition

This principle is solving a complete problem into its elements in the form of a hierarchical decision-making process where each element or elements are interconnected. If you want to get accurate results, the solution is carried out on the elements until it is impossible to do further solving so that several levels of the problem are obtained (Pedrycz, 2014). The decision hierarchy structure can be said to be complete and incomplete. A hierarchy is said to be complete if all the elements at one level relate to all the elements at the next level, while an incomplete decision hierarchy is the opposite of complete.

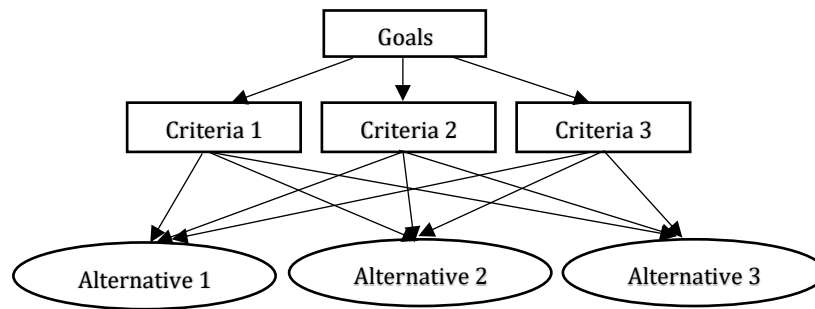


Figure 1. Decision hierarchy from AHP (Source: Mulyono, 2004)

The decomposition structure is:

- First level: Decision goals (goals)
- Second level: Criteria
- Third level: Alternatives

2. Comparative judgment

This principle provides an assessment of the relative importance of two elements at a certain level in relation to the level above it. This assessment is the essence of using the AHP method. This assessment can be poured into a matrix form called the pairwise comparison matrix, namely a pairwise comparison matrix that contains the preference level of several alternatives for criteria. Preference scale with a scale of 1 shows the lowest level up to a scale of 9 the highest level. The pairwise comparison scale is presented in the following table:

Table 1. Paired Comparison Scale

Intensity interest	Definition
1	Just as important as the others
3	A little more important than others
5	Quite important compared to the others
7	Very important compared to others
9	Extreme importance than others
2,4,6,8	Score between two adjacent assessments

Reciprocal	If element I has one of the above numbers compared element j, then j has the opposite value when compared to i
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Source: Mulyono (2004)

3. Synthesis of Priorities

In this principle, a pairwise comparison matrix is presented which is then searched for the eigenvectors to get local priority. Because the pairwise comparison matrix exists at each level, to obtain global priority, synthesis can be carried out between local priorities.

4. Logical consistency

It is the most important characteristic. This can be achieved by aggregating all the eigenvectors to get a weighted composite vector that produces a sequence of decisions. In the AHP analysis, there are stages in the strategic planning process, namely:

- 1) Step 1: define in advance the criteria that will be used as a benchmark for problem solving and determine the level of importance of each criterion.
- 2) Step 2: calculate the value of the comparison matrix of each criterion based on the importance value table (Table 2). In calculating the value of the comparison matrix using a table like the following:

Table 2. Comparison Matrix

	Criteria 1	Criteria 2	Criteria n
Criteria 1	1		
Criteria 2		1	
Criteria n			1

- 3) Step 3: calculate the eigenvalues and test their consistency. If it is not consistent then the data collection is repeated.
- 4) Step 4 : repeat steps 2 and 3 for all hierarchical levels.
- 5) Step 5: calculate the eigenvectors of each pairwise comparison matrix which is the weight of each element for determining the priority of elements at the lowest hierarchical level to reach the goal.
- 6) Step 6: calculate the consistency index value.

The value of the consistency index (CI) can be calculated using the formula: $CI = (\lambda - n) / n$

Information:

* (n) is the number of elements

7) Step 7: calculate the value of the consistency ratio

The priority value is obtained from the column multiplied by the row number

Determination of priority use so that CR less than <1.0 can be used with the formula $CR = (IR / CI)$

Based on the AHP rules, the weighting must have a CR value of less than <0.1 , so the priority is used properly. the weighting value is more than > 0.1 then the test value is not good. in this study the researcher will use the expert choice application version 11.0 which will make it easier to calculate these comparisons.

RESEARCH AND RESULTS

Hierarchy of Criteria, Alternatives

The decision model for selecting product priorities that are feasible to be developed at UKM Monity Jaya Barsama takes the first step by determining: 1. Objectives; 2. Criteria: Taste, Price, Quality, Packaging; 3. Alternative: Original Ginger, Mocca Ginger, Extra Spicy Ginger. The hierarchy of criteria and alternatives for Sukma Jahe products can be seen in Figure 2.

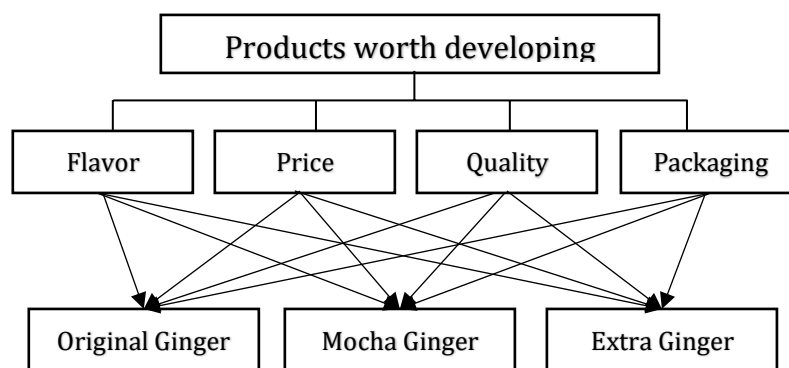


Figure 2. AHP Hierarchy Diagram

Based on Figure 2, we get a description of the criteria and alternatives for the Sukma Jahe product with qualitative information.

Table 3. Pairwise Comparison Matrix of Respondents

Comparing Criteria		Expert 1	Expert 2	Expert 3	Expert 4
Flavor >< Price	K1>< K2	9	0,14	9	9
Flavor >< Quality	K1><K3	0,11	9	9	0,11
Flavor >< Packaging	K1><K4	0,11	0,14	9	5
Price >< Quality	K2><K3	0,11	7	0,11	0,13
Price >< Packaging	K2><K4	9	0,14	0,11	0,17
Quality >< Packaging	K3><K4	9	0,14	9	7

Table 4. Mean Geometric Matrix from Respondent Matrix

Criteria	K1	K2	K3	K4
K1	1	3,19	1	0,91
K2	0,31	1	0,32	0,39
K3	1	3,13	1	3
K4	1,10	1,10	0,33	1
Total	3,41	8,41	2,65	5,20

The data on the importance of pairwise comparisons between criteria from several respondents can be seen in Table 3 while for the sum of the geometric mean in the Respondent matrix seen in Table 4. From the sum of the geometric mean matrices in Table 4, the normalization matrix will then be calculated by dividing each number in each column with the number of columns respectively and followed by calculating the average value in each row as shown in Table 5.

Table 5. Normalized matrix and priority weights or row averages

Criteria	K1	K2	K3	K4	Total	Priority Weight
K1	0,29	0,38	0,38	0,17	1,22	0,31
K2	0,09	0,12	0,12	0,07	0,40	0,10
K3	0,29	0,37	0,38	0,57	1,61	0,40
K4	0,32	0,13	0,13	0,19	0,77	0,19
Total	1	1	1	1	4	1

The line average gives the level of importance of the four aspects of the criteria, according to respondents, quality is considered the most important in a product criterion with a presentation of 40%. Then the ratio consistency is calculated, where the consistency calculation is as follows:

1	3,19	1	0,91		0,31		1,20
0,31	1	0,32	0,39		0,10		0,40
1	3,13	1	3	x	0,40	=	0,60
1,10	1,10	0,33	1		0,19		0,77

After obtaining the consistency calculation above, then the Consistency Vector calculation is carried out as follows:

1,20		0,31		3,95
0,40		0,10		3,95
1,60	/	0,40	=	3,98
0,77		0,19		4,03

Then the average of the four data in the last column is 3.98 Consistency Index on a matrix of order 4 so that the CI is 0.00778.

The next step is to calculate the Consistency Ratio (CR), where the Random Index (RI) with $n = 4$ is 0.58 (obtained from the random index table), then the CR value is 0.00864. The results obtained show that the data is consistent. because the CR value ≤ 0.00864 for 4 4x4 matrices (Lee et al., 2008). So we can conclude that the respondents in this questionnaire are consistent with their answers. The researcher only performed data processing once in the consistency test, because the respondents were consistent in filling out the questionnaire to fill in the pairwise comparison matrix.

Alternative Calculations on each Criterion

After calculating the pairwise comparison matrices on the criteria, then proceed to the alternative pairwise comparison matrices for each criterion, which can be seen in Table 6.

**Table 6. Matrix of Alternative Comparison Questionnaire
Results with Criteria (Taste)**

K1 (Plavor)		Expert 1	Expert 2	Expert 3
Ori Ginger >< Mocca Ginger	A1><A2	0,29	0,38	0,38
Ori Ginger >< Extra Ginger	A1><A3	0,09	0,12	0,12
Mocca Ginger >< Extra Ginger	A3><A3	0,29	0,37	0,38

Because in this case it consists of several respondents, it is calculated using the geometric mean.

Table 7. Geomatrix of Mean from Respondent Matrix

K1	A1	A2	A3
A1	1	8,27	1,58
A2	0,12	1	0,52
A3	0,63	1,92	1
Total	75	11,2	3,1

To calculate the weight of the comparison matrix of alternative pairs with K1 criteria (Feel), first do the sum of each number in each column with the number of columns in each as shown in Table 8. After the sum of each alternative is divided by the sum that we have get as shown in Table 8. The weight is calculated by finding the average value of each row in the pairwise comparison matrix.

Table 8. Normalization

K1	A1	A2	A3	Total	Weight/ Priority
A1	0,57	0,74	0,51	1,82	0,61
A2	0,07	0,09	0,17	0,33	0,11
A3	0,36	0,17	0,32	0,86	0,29

After that, the calculation of the consistency ratio is carried out, where the calculation of the consistency is as follows:

1	8,27	1,58		0,61		1,96
0,12	1	0,52	x	0,11	=	0,33

0,63	1,92	1		0,29		0,88
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1,58		0,61		1,96	Lamda Max	3,114,372
0,52	/	0,11	=	0,33	CI	0,057186
1		0,29		0,88	CR	0,098597

The CR value of the alternative criteria K1 (Taste) is 0.098597, this indicates that the value is consistent, because the CR value is ≤ 0.1 for a 3x3 matrix. So it can be concluded that this questionnaire is consistent. The respective alternative CR values for each criterion can be seen in Table 9.

Table 9. Alternative CR values for each criterion

CR Value of Alternatives on Criteria	
Alternative (Criteria)	Value (Consistensy Rasio)
Alternative K1	0,098597
Alternative K2	0,043358
Alternative K3	0,048822
Alternative K4	0,008930

Table 9 shows that the alternative CR values for each criterion are consistent because the CR value is ≤ 0.1 for the 3x3 matrix. So it can be concluded that the respondent in assessing each alternative is consistent with the answer.

Rating

The criteria data taken in this study were 4 items, namely: Taste, Price, Quality and Packaging. While the alternative data as a product from UKM Monity Jaya Bersama is Ginger Original, Ginger Mocca, Ginger Extra Spicy. Criteria data and the value of each alternative are obtained from the results of the assessment that has been carried out by expert respondents. The global priority weights can be seen in Table 10

Table 10. Global Priority Weighted Values and Product Rankings

Product	Plavor	Price	Quality	Packaging		Weight Criteri a		Weight Total	Priority
Original Ginger	0,606	0,544	0,506	0,327		0,13		0,5060	I
Mocca Ginger	0,109	0,214	0,179	0,221	x	0,10	=	0,1691	III
Extra Ginger.	0,285	0,242	0,315	0,452		0,40		0,3248	II

The value in the column is the value of the comparison between alternatives with criteria where the criteria have 4 items, so the table above also has 4 columns for the weight of the criteria for each alternative. Then the value in the alternative row is multiplied in each alternative row with each criterion weight column, then the total alternative weight results are obtained. From the total weight of the alternatives, it can be immediately known the ranking of each product, namely for the first ranking, the value is 0.506 for Ginger Original, for the second rank, it is obtained for 0.324 for Extra Spicy Ginger and for the third rank, with a value of 0.169 for Mocca Ginger.

CONCLUSIONS AND RECOMMENDATIONS

From the results of research that has been done on the AHP method, it can be concluded that the results obtained in the decision system to determine the priority of products that are feasible to develop are the Original Ginger Sukma product with a priority weight of 0.506.

From the research that has been done, the authors suggest that overall this original Sukma ginger product is very good, maybe in the future SMEs can innovate by making this original sarabba into a ready-to-drink product using bottled packaging.

REFERENCES

- Aziz, N.F., Sooroshian, S, dan Mahmud, F. 2016. *MCDM-AHP Method in Secision Makings*. ARPN Journal of Engineering and Applied Sciences. **11**(XI) : 7217-7220
- Kusrini. 2007. Konsep dan apikasi sistem pendukung keputusan . Yogyakarta: CV. Andi Offiset



- Mahendra, G. S., & Aryanto, K. Y. 2018. SPK Penentuan Lokasi ATM Menggunakan Metode AHP dan SAW. *Teknologi dan Sistem Informasi*, 5(1), pp. 2460-3465
- Pedrecz W dan Song, M., 2014, A Granulation of Linguistic Information in AHP Decision Making problems, *informations Fusion*, 17, 93-101
- Utama, D. N. 2017. *Sistem Pendukung Keputusan, Filosofi Teori dan Implementasi*. Yogyakarta: Garudhawaca
- Wulansari N,A., Ranihusna, D., Maftukhah, 2017, Strategi Perencanaan SDM Untuk Peningkatan Daya Saing Umkm Batik Semarang, *Prosiding Seminar Nasional Multi Disiplin Ilmu & Call For Papers Unisbank (Sendi_U)*, ISBN: 978-979-3649-81-8

