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Enhancing E-Commerce Readiness of Regional Flagship Product: AHP-Based Packaging Selection for *Kembang Goyang*

Perak Samosir[1], Yenny Widianty[2], Ratnawati[3], Ruth Nattassha[4]
[1,2,3]Institut Teknologi Indonesia, South Tangerang, Indonesia
[4]Bunda Mulia University, Tangerang, Indonesia
[1]samosirperak@gmail.com

Abstract

This study aims to determine the most appropriate packaging for kembang goyang to improve the e-commerce readiness of regional flagship product In South Tangerang. This study uses a quantitative method with the Analytical Hierarchy Process (AHP) approach. The study population consists of experts who have experience in food product development and MSME management. The research sample was determined using a purposive sampling technique with 15 experts, consisting of researchers, food experts, and kembang goyang MSME actors. Data were collected through paired comparison questionnaires and analyzed using Expert Choice software. The results show that product protection criteria and packaging strength are the most important factors in packaging selection. Canister packaging becomes the best alternative compared to other packaging. The implications of this study indicate that selecting the right packaging can improve the e-commerce readiness of MSMEs.

Keywords: Analytical Hierarchy Process, E-Commerce Readiness, Packaging Selection, Regional Flagship Product.

1. Introduction

One of the goals in Regional Tourism Development Master Plan 2022-2025 by South Tangerang City Government (2022) is determining and supporting the development of regional flagship product by micro, small, and medium enterprises (MSME). In a research conducted by local university and South Tangerang Department of Industry and Trade with experts and local communities as survey participants (Fitriadhy et al., 2024), it was identified that one of the proposed top-ranked regional flagship products of South Tangerang is *kembang goyang*. After the product was determined, the next step that has been identified for this project is to extend its market coverage. The product of one MSME has been widely sold in South Tangerang, but there are several challenges met when trying to broaden the distribution to other areas. One of them is the issue of product packaging.

In a preliminary interview with the MSME owner, it was found that the MSME had actually tried to expand its market to online market. However, the *kembang goyang* snack is fragile and often gets damaged in transit. Several times, to appease the online customers, the MSME had to use the most expensive delivery option just to send a replacement product because the previous shipment had the *kembang goyang* all broken up during transit. This delivery option is both not sustainable for the business and not a preferable option for the customers. There was another option to use vacuum sealing, but the machine to conduct such packaging technique was out of the budget for a MSME. So for now, their best option is to sell locally or using a standing pouch, in which the latter still pose a risk of breakage.

This issue highly impacts the e-commerce readiness of *kembang goyang*, especially in the factor of logistics performance. E-commerce readiness is defined as the measurement of how ready a subject, be it a nation, economy, or a business, to

adopt e-commerce and obtain the benefits they will gain from this (Priambodo et al., 2021; Hourali et al., 2008). There are several aspects to be considered whether a business is ready to adopt e-commerce. First is whether the business is equipped with the necessary technology in transportation planning and resource optimization (Lim et al., 2022; Richey et al., 2007). Then there is the aspect of customer experience and interaction, related to how customers reach the business and make the purchase through e-commerce, which can be heavily affected by the delivery speed and accuracy of the delivered products (Deshpande & Pendem, 2023). These aspects heavily impact the logistics performance of the business (Tian et al., 2025). Existing research have also demonstrated that it is highly important to consider the digital aspects to improve MSME's business (Cahya & Christian, 2020; Hartono et al., 2023; Winarko et al., 2020).

Logistics performance is closely related to the packaging of the products. Studies have found that the size and units of packaging will affect transportation of product, especially the storage, handling costs, and the required vehicle size to conduct the transportation (Laeequddin & Sahay, 2021). Optimization of product packaging sold in e-commerce also affects the logistics performance by reducing costs for the business as well as improving sustainability (García-Arca et al., 2025). The performance will in turn affect the customers' perspective about businesses, as faster delivery times and efficient packaging lead to higher rating and increased sales, as shown in a study regarding customer behavior in e-commerce by Deshpande and Pendem (2023). Thus, when considering a business' readiness to sell their products in e-commerce, it is important to consider how the products is going to be packaged.

Packaging for snacks with characteristics similar to *kembang goyang* has to be designed with several considerations in mind. First, because the snack is easy to break, the packaging should have adequate cushioning and structural integrity to protect the snack product from external pressure and impact (Farrell et al., 2024; Jayan et al., 2018; Serna-Saldivar, 2022). The packaging should also be able to protect the product and maintain freshness (Farrell et al., 2024; Serna-Saldivar, 2022). There is also issue regarding whether the packaging is easy to open and reclose for the customers (Farrell et al., 2024). Other than that, the matter of balancing cost and performance should also be considered in determining the packaging (Mudgal et al., 2024). The impact of chosen packaging to environment should also be considered, to ensure sustainable practices are implemented (Saha et al., 2019; Serna-Saldivar, 2022).

Through preliminary interview with the MSME owner and observation on available packaging types around the area, four possible packaging options have been defined: one is being used by the MSME, one an improvement to another option used by the MSME, and the last two are new additions to the options. Plastic jar is one of the most popular options used by the MSME. The next option is using standing pouch, which is improved by vacuum sealing to ensure the packaging's structural integrity. Then, it is also possible for the business to use canister, similar to the ones being used to store potato chips. And finally, using plastic tray and a box will ensure the *kembang goyang* has double the protection.

This study aims to find out which of these packaging options is the best choice for *kembang goyang*, especially in the context of selling the products through e-commerce. In order to determine which packaging should be used to improve *kembang goyang*'s e-commerce readiness, the packaging options are measured with these considerations: product protection, mechanical strength, convenience, cost, and eco-friendliness. Said considerations are used as the criteria in analytical hierarchy

process analysis (AHP), where each of them is assigned their own relative weight and the scores for each packaging option can be measured based on these criteria (Habsari et al., 2022; Rattanakool et al., 2024). The findings of this research are expected to assist the MSMEs selling *kembang goyang* in making informed decision for the packaging of their product.

2. Literature Review

E-commerce Readiness and Logistics Performance

E-commerce readiness is defined as the measurement of how ready a subject, be it a nation, economy, or a business, to adopt e-commerce and obtain the benefits they will gain from this adoption (Hourali et al., 2008; Priambodo et al., 2021). There are several aspects to be considered whether a business is ready to adopt e-commerce. First is whether the business is equipped with the necessary technology in transportation planning and resource optimization (Lim et al., 2022; Richey et al., 2007). Then there is the aspect of customer experience and interaction, related to how customers reach the business and make the purchase through e-commerce, which can be heavily affected by the delivery speed and accuracy of the delivered products (Deshpande & Pendem, 2023). These aspects heavily impact the logistics performance of the business (Tian et al., 2025).

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Utilizing Analytical Hierarchy Process (AHP) in Choice Selection

The Analytical Hierarchy Process (AHP), developed by Saaty (1987), is a tool which can be used to make decisions regarding several options by using multiple criteria. The problem of deciding between alternatives is decomposed into a hierarchy of goals, criteria, and alternatives. Through this method, decision-makers can compare the relative importance of each criterion, especially related to the goals. All relevant aspects which contribute to the decision are identified before the evaluation is conducted. Through pairwise comparison in AHP, qualitative judgements from experts can be converted into quantitative priorities of criteria and alternatives, balancing the subjective and objective considerations in decision making.

Petrillo et al. (2023) especially highlight that AHP's strongest point is its ability to define a structure of well-founded criteria set which reflect the final goals in decision making. Without identification of this set, there are risk of biased or inconsistent result in the consideration of alternatives. By using comprehensive criteria set, experts are able to maintain the consistency of their judgement, increasing the reliability and replicability of the process. This makes AHP particularly relevant in

problems with multiple dimensions, where several factors must be assessed simultaneously.

In recent studies related to food packaging, it is evident that establishing the criteria list for packaging is highly important. Sun et al. (2023) used an AHP–Fuzzy Comprehensive Evaluation (FCE) model to compare reusable takeaway container designs, identifying critical criteria related to environmental sustainability, user convenience, and material durability before the selection process is conducted. Likewise, Nasoik et al. (2023) applied AHP in *kripik talas* packaging design, establishing sensory and aesthetic criteria through Kansei Engineering before choosing between design alternatives. These applications demonstrate that constructing criteria set is a foundation for ensuring valid and reliable results in AHP-based packaging selection.

Identification of Criteria in Package Selection

The criteria to conduct choice selection for *kembang goyang* packaging are determined through literature review. First is the aspect of product protection. In this aspect, the packaging is considered based on how well it protects the products from external factors. In the matters of snack products such as *kembang goyang*, the packaging has to protect the snack from moisture, oxygen, light, and other environmental factors (Arvanitoyannis, 2012; Joy et al., 2018; Serna-Saldivar, 2022). This is especially important to prevent product flavor degradation and texture loss. In protecting the products, the existence of packaging should be able to extend shelf life of the products by maintaining its condition and preventing microbial contamination (Gheorghita & Gutt, 2021; Joy et al., 2018). Thus, when measuring a packaging's performance in this quality, it should reflect how well the packaging will protect the products, especially snack products, from environmental factors and maintain the product condition.

Mechanical strength refers to how well the packaging material is able to maintain its form during handling, transportation, and storage without breaking (Fernández-Menéndez et al., 2021; Zhang et al., 2022). If the packaging has good mechanical strength, it will be able to prevent the products from breaking during the logistic processes. This is especially important in the matter of brittle snack products such as *kembang goyang*, which easily break even under the slightest of pressure. Choosing a package with good mechanical strength will ensure that the *kembang goyang*'s form is maintained during the transportation processes.

Other important aspect to consider in the matter of packaging for brittle snack products is convenience. In this case, convenience refers to the customers' convenience: how easy it is for them to open, reseal, or carry the snack's packaging from one place to another (Arvanitoyannis, 2012; Farrell et al., 2024; Kaleido, 2003). It is especially important for snacks like *kembang goyang* because the packaging has to allow the customers to easily and safely access the snack without breaking its brittle structure. Allowing the ability to be resealed in the packaging also enables the customer to portion the snack and consume it not in one go, which increases the convenience in eating the snack (Chu et al., 2024).

The eco-friendliness criterion in food packaging refers to how well a packaging option minimizes its negative effects to the environment while maintaining functionality and safety of the product (Saha et al., 2019; Serna-Saldivar, 2022). As highlighted by Bócoli et al. (2025), sustainable packaging solutions are increasingly

necessary to address the negative effects of conventional materials to the environment, especially focusing on reducing wastes, conserving resources, and adopting biodegradable or recyclable alternatives. It is also important to note that considering the environmental impact of food packaging cannot be done by considering the raw materials alone, but also the entire life cycle of the packaging: production, transportation, and end-of-life management such as reuse, recycle, or through biodegradation (Arfelli et al., 2024). Thus, for snack product, other than maintaining the snack's integrity and protecting it during transportation, it is also important to consider the eco-friendliness of the package to increase the environmental sustainability of the product.

The final criterion in this research is cost. In food packaging, cost refers to how much the financial resources in producing and delivering the packaging is compared to its functional use, whether the functionality of packaging justifies the financial resources it takes. Atta-Delgado et al. (2024) mention that while the sustainability and the functional design of food packaging are important to customers, the affordability of products still remains one of the strongest aspect in purchase decision. In other research by Granato et al. (2022), it is demonstrated that customers are more likely to have limited willingness in paying more to afford the higher production cost of environmentally friendly packaging. This case is especially evident in customers of food products from MSME, requiring them to prioritize the cost efficiency in relation to the packaging's functional and sustainability aspects (Mudgal et al., 2024). Thus, for the matters of cost, it is necessary to measure not only the expenses in manufacturing the packaging but also the customers' sensitivity to the product price which also encompasses the packaging.

3. Method

This research is a quantitative research, using analytical hierarchy process (AHP) as the main framework. AHP was developed by Saaty (1987), mainly used as a decision-making method which evaluates several options, called alternatives, according to more than one criteria. Through this method, the subjective evaluation of experts is turned into quantitative data by using pairwise comparison between alternatives. With these characteristics, AHP as a framework is especially suitable for problems which has more than one alternative and multiple criteria to evaluate them on, integrating both the qualitative and quantitative aspects of the research (Petrillo et al., 2023). In this research, AHP is used to determine the most suitable packaging for *kembang goyang* based on five criteria which have been identified from literature review: product protection, mechanical strength, convenience, cost, and eco-friendliness. In AHP, while it is possible to include multiple levels for criteria through sub-criteria, the core hierarchy only requires the goal, criteria, and alternatives. Sub-criteria are used only when capturing the complexity of the problem requires additional decomposition of the criteria (Saaty, 1990). In the context of this research, the criteria defined from literature review sufficiently represent the decision factors required to measure the packaging alternatives, with each criterion representing a distinct factor of packaging quality important in e-commerce usage. Thus, AHP can be validly used without sub-criteria in this research.

The population of this study are experts who have academic knowledge and practical experiences in the food product development and business operations in Banten province of Indonesia. They are selected through purposive sampling method,

as the AHP method relies on the expertise of the respondents rather than large number of samples (Wulandari et al., 2023). For this research, 15 experts are selected, consisting of researchers, food experts, and owner of *kembang goyang* MSME. With this combination, a balance between academic and practitioner perspectives can be achieved in the research. Each expert is expected to understand the many perspectives of evaluating packaging for food product, which involves not only the functional aspects but also its impact to customer satisfaction. This sample size aligns with the common number of various AHP studies, which is in the range of 5-20 experts (Nasoik et al., 2023; Sun et al., 2023).

In this research, primary data sources are used. The primary data are collected through structured questionnaire designed based on AHP framework, consisting of pairwise comparisons between criteria and alternatives. Comparison of each pair is measured using a nine-point scale, in which 1 means the pair has equal importance and 9 means the chosen one is more important or more preferable than its pair (Saaty, 1987). In the first section of the questionnaire, the respondents are asked to compare the relative importance of each criterion against others, such as demonstrated in Table 1.

Table 1. Criteria Comparison Questionnaire

Left Column	More Important More Important 9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Right Column
Product Protection		Mechanical Strength
Product Protection		Convenience
Product Protection		Eco-friendliness
Product Protection		Cost
Mechanical Strength		Convenience
Mechanical Strength		Eco-friendliness
Mechanical Strength		Cost
Convenience		Eco-friendliness
Convenience		Cost
Eco-friendliness		Cost

The choices of packaging, shown in Figure 1, are collected through preliminary interview with the MSME as well as observation for available packaging options in South Tangerang, Banten. First, marked as number 1 in Figure 1, there is the plastic jar packaging which has been used by the MSME to sell *kembang goyang* in online market. The weakness of this jar is that this packaging isn't strong enough to prevent the snack from breaking, though already enveloped by bubble wrap. The second option, marked as number 2 in Figure 1, is standing pouch which has been used by the MSME. In this option, the packaging is improved by vacuum-sealing the bag, as the MSME hasn't started using this type of sealing due to the high cost. As for the new options, the first one is using food-grade canister, marked as number 3 in Figure 1, which is stronger and better suited to the *kembang goyang*'s size. The second one is using plastic tray and box, marked as number 4 in Figure 1, in which the size of plastic

tray is tailored to match the size of *kembang goyang* to prevent it from moving inside the packaging.

Figure 1. Packaging Options

After the criteria have been measured pairwise combination, the next stage in data collection is conducted by measuring each packaging option against other options for each criterion. One example is in Table 2, in which the packaging methods are compared in the matter of product protection. Through this method, it is possible to show how each packaging type may be more superior on one criterion, but not on the others. Similar to the criteria comparison questionnaire, the experts will choose from 1 to 9 to determine which packaging is more superior in that particular criterion, with 1 being slightly more superior and 9 strongly more superior.

Table 2. Packaging Comparison for Product Protection Criterion

	More Superior									More Superior	
Left Column	9	8	7	6	5	4	3	2	1	2 3 4 5 6 7 8 9	Right Column
Plastic Jar											Vacuum Standing Pouch
Plastic Jar											Canister
Plastic Jar								√			Plastic tray and box
Vacuum Standing Pouch											Canister
Vacuum Standing Pouch											Plastic tray and box
Canister											Plastic tray and box

The collected data are then analyzed using AHP with the Expert Choice software, in which the AHP structure of the analysis is presented in Figure 2. The criteria comparison data from the 15 experts are processed to determine the relative weights of each criterion. Then, the weights are used to measure each packaging's score based on the judgement of the experts regarding their relative superiority against other packaging alternatives in each criterion. The Expert Choice automatically calculate the normalized weights and conduct consistency test by calculating consistency ratio (CR). Consistency ratio with value below 0.1 indicates acceptable consistency for the analysis (Petrillo et al., 2023). The resulting criteria weights and packaging alternatives rank are then used to identify the most suitable packaging alternative to better enhance *kembang goyang*'s e-commerce readiness.

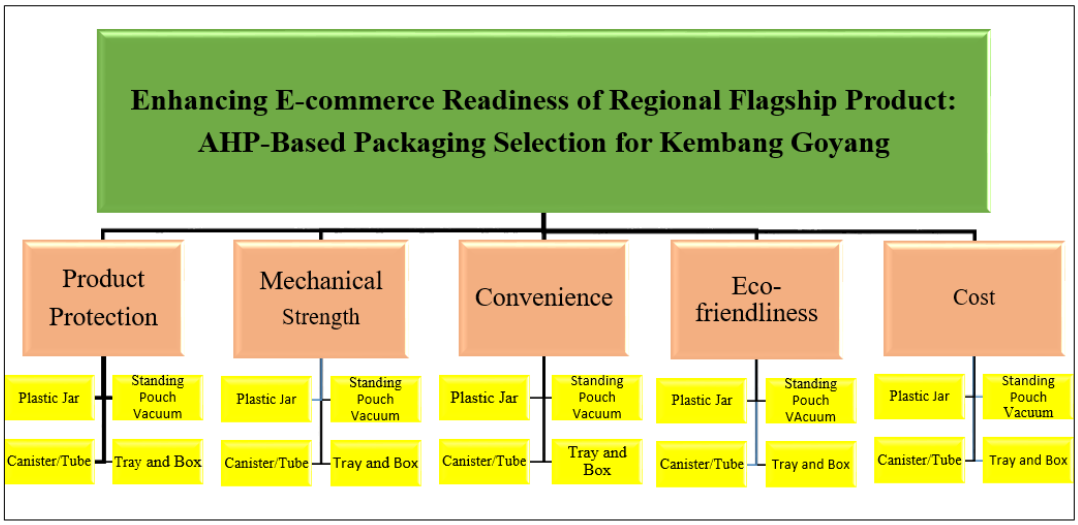

Figure 2. Research AHP Structure

4. Result and Discussions

In this section, the results of AHP analysis conducted to determine the most suitable packaging to enhance *kembang goyang*'s e-commerce readiness are presented. These results include the rank and relative weights of the five criteria, as well as the score and rank of the packaging alternatives based on the criteria set and their weights. The consistency of AHP result and reliability of agreement among the experts' judgement are also presented alongside the result.

As previously mentioned in research method section, the selected 15 experts firstly measure each criterion's relative importance compared to other criteria in a pairwise comparison. The five criteria to be compared are product protection, mechanical strength, convenience, eco-friendliness, and cost. Evaluation of these criteria from the 15 experts are then processed by the Expert Choice software.

In Table 3, the pairwise comparison of the five criteria is presented. Each criterion is compared directly to other criterion, and the value indicates the relative importance of said criterion. As can be observed in the table, product protection criterion has higher score when compared to mechanical strength (1.635), convenience (2.449), eco-friendliness (2.945), and cost (1.780). This result can be inferred as the experts strongly considering the ability of packaging to protect *kembang goyang* product is the most important quality. This is also followed by mechanical strength criterion, which is also considered more important that convenience (1.494), eco-friendliness (1.801), and cost (1.088). These two criteria

together show that in the context of e-commerce distribution, for brittle snacks like *kembang goyang*, it is very important for the packaging to be able to protect the product and keep the snack's form as much as possible. Meanwhile, difference between importance of convenience, eco-friendliness, and cost aren't too high apart. This shows that their perceived importance is less considered by the expert compared to the other two criteria. Afterwards, these pairwise comparison become the basis to calculate the criteria weights in Table 4.

Table 3. Pairwise Comparison of Criteria Score

Criterion	Mechanical Strength	Convenience	Eco-friendliness	Cost
Product Protection	1.635	2.448	2.945	1.780
Mechanical Strength	-	1.494	1.801	1.088
Convenience	-	-	1.203	1.376
Eco-friendliness	-	-	-	1.655

The result of criteria ranks and relative weight is presented in Table 4, with consistency ratio (CR) 0.00441. As this number is below 0.1, it can be concluded that this result has passed the consistency test. Among the five criteria, the experts have concluded that product protection to be the most important one, with its relative weight amounting to 0.342 in the criteria set. This has shown that for the experts, packaging for *kembang goyang*, which can be considered a brittle snack, must be able to protect it from physical and environmental damage. This allows the product's pristine condition to be maintained, preventing flavor degradation and texture loss. This result is also supported by existing research (Gheorghita & Gutt, 2021; Serna-Saldivar, 2022). Thus, when evaluating packaging alternatives' score for being used as *kembang goyang*'s packaging, product protection will have the utmost consideration.

Table 4. Rank and Relative Weights of Criteria

No.	Criterion	Rank	Weight
1	Product Protection	1	0.342
2	Mechanical Strength	2	0.209
3	Cost	3	0.192
4	Convenience	4	0.140
5	Eco-friendliness	5	0.116

The criterion ranking in second place, mechanical strength, is also related to the product protection aspect, as it considers the packaging's strength to maintain its form especially during the transportation of the product. As the aim in this research is to find which packaging to improve *kembang goyang*'s readiness to be sold through e-commerce, this criterion is also highly important when considering the package. When sold through e-commerce, *kembang goyang* will most likely be transported using third-party logistics, and the packaging should have the mechanical strength to withstand this process. This finding is also supported by existing research, mainly by Fernández-Menéndez et al. (2021) and Zhang et al. (2022).

The third to last ranked criteria are cost, convenience, and eco-friendliness. Cost has relative weight of 0.192 while convenience's relative weight is 0.140. This demonstrates that while both cost and convenience of the packaging are important factors in customer's satisfaction towards the product, they still aren't more important that the product they have to protect, which in this case is the *kembang goyang*. This

evaluation also can be supported by the fact that *kembang goyang* is brittle, and if it gets broken during transportation the customers' experience when eating it will be greatly affected. Interestingly, eco-friendliness is ranked last with 0.116 weight. This result demonstrates that while the effects of packaging to the environment is increasingly more important, it still doesn't take priority when compared to the functionality and the cost performance of the packaging itself. This result is supported by existing research such as Bócoli et al. (2025) and Arfelli et al. (2024), which demonstrate that MSME tends to favor other factors than eco-friendliness because of the limitation of their resources.

After the relative weights of each criterion are determined, the next stage in this AHP analysis is to find the ranking and the score of each packaging alternatives based on the experts' judgement, with consideration to the relative weights. For each criterion, the 15 experts have conducted pairwise comparison between all alternatives. In Table 5, the relative weights of each packaging for each criterion are presented. For the product protection criterion, standing pouch achieves the highest value (0.307) followed closely by plastic jar (0.291) and canister (0.284). For the mechanical strength criterion, canister achieves the highest value (0.338) followed by plastic jar (0.303). For the convenience criterion, standing pouch and canister has higher score, 0.324 and 0.313 respectively. This might be caused by the fact that these two packaging alternatives can be easily opened and resealed by the customers. In eco-friendliness criterion, both plastic jar (0.311) and canister (0.290) have the highest values. For the cost criterion, plastic jar (0.296) and canister (0.292) again scored higher compared to other packaging alternatives. There results show that the packaging alternatives has their own strengths in each criterion, so the weight of each criterion will contribute highly to the decision of which packaging alternative is the best.

Table 5. Packaging Weights for Each Criteria

Packaging Alternative	Product Protection	Mechanical Strength	Convenience	Eco-friendliness	Cost
Canister	0.284	0.338	0.313	0.290	0.292
Plastic Jar	0.291	0.303	0.186	0.311	0.296
Standing Pouch Vacuum	0.307	0.210	0.324	0.192	0.159
Tray and Box	0.118	0.149	0.177	0.207	0.252

The scores are then weighted using the relative weights obtained in the previous stage of this research. The result of this process can be observed in Table 6, with consistency ration (CR) of 0.00. As this value is below 0.01, it can be concluded that the result of alternatives ranking has passed the consistency test. Canister has the highest score, with its weight compared to other alternatives is 0.304. It is followed by plastic jar with 0.282 weight, standing pouch with 0.247 weight, and boxed tray with 0.169 weight. This result shows that by considering the criteria set, using canister as packaging for *kembang goyang* has the highest ability to enhance the snack's e-commerce readiness. This finding is supported by the fact that the canister can be customized to match *kembang goyang*'s size, just like storing potato chips inside one. It is also convenient for the customers to use because it can be opened and resealed with ease. However, the cost of this packaging might be higher than the standing pouch and plastic jar already used by the MSME. On the other side, the eco-friendliness of this

packaging can be higher compared to the options already used by the MSME due to the fact that it is possible to use recyclable materials for the canister's body. It is also possible to decorate the canister with more attributes of the business, allowing its unique design to increase the product's attractiveness.

Table 6. Ranking and Relative Weights of Packaging

No.	Packaging Alternative	Rank	Weight
1	Canister	1	0.302
2	Plastic Jar	2	0.282
3	Standing Pouch Vacuum	3	0.247
4	Tray and Box	4	0.169

The other new packaging alternative suggested in this research, boxed tray, has the lowest score compared to other alternatives. From this result, it can be concluded that the experts judge this packaging performs the poorest when it is evaluated with the criteria set, compared to other alternatives. This can also be caused by the fact that using boxed tray is something that has never been used for *kembang goyang* before, as it is more common to use for chocolate and biscuits. However, this packaging allows the customer to see the appearance of the snack inside, which has the chance to make creative improvements for *kembang goyang* by decorating it and giving it new flavors. The possibility of using this packaging and further enhancing the snack's creative appeal can be a subject for future research.

Sensitivity analysis was also conducted to observe if changing the relative importance of each criterion will affect the ranking presented in Table 6. The result of this analysis is that the overall ranking is generally stable, and change in the rankings only occur when the criterion weight is highly. For the product protection criterion, weight must be increased to 83.7% so the standing pouch vacuum becomes the first ranking alternative. Changing the weight of mechanical strength, however, does not change the ranking of alternatives. In the case of convenience criterion, standing pouch vacuum can become the first ranking alternative if the weight is increased to 88.1%. For the eco-friendliness, changing the importance to 75% results in plastic jar in the first ranking of the alternatives. As for the cost criterion, changing the importance up to 74.6% only affect the rankings of third and fourth ranking packaging alternatives, standing pouch vacuum and boxed tray, making them switch places while the first and second ranking remain. Overall, this result suggests that the model is relatively stable and changes in ranking only happens when the weight of criterion is changed drastically.

Based on the results of AHP analysis, canister packaging was identified as the best alternative for enhancing *kembang goyang*'s e-commerce readiness. This result is then analyzed further by using the qualitative Benefit-Opportunity-Cost-Risk (BOCR) analysis. In terms of benefits, canister packaging has structural rigidity compared to other alternatives with flexible material, making it able to provide effective protection for brittle snacks such as *kembang goyang* during its e-commerce distribution processes. This aligns with the AHP analysis, in which product protection and mechanical strength are considered as the most important criteria for enhancing the snack's e-commerce readiness. By maintaining product integrity, this packaging reduces the risk of breaking and improves the customer experience when purchasing the snack through e-commerce. This packaging alternative also provides an

opportunity for the MSME to differentiate their products in the increasingly competitive online markets. The surface of canister, both the top-bottom part and the sides, can be customized to add elements unique for the business, enhancing the product value perceived by the customers. Example of such elements being the brand logo, premium visual design, and informative labeling regarding the *kembang goyang* product. Canister packing can also be reused for other purposes, so its reusable nature can offer potential environmental benefits and may appeal to customers who value sustainability in their products. All in all, these benefits and opportunities support the strategic positioning of *kembang goyang* as regional flagship product, enhancing its ability to be sold to other regions through e-commerce.

However, for the MSME, adopting canister packaging may also incur higher cost compared to using standing pouch or plastic jar alternatives, which they are already using. The increased material and production costs may affect pricing decisions further down the line. It is necessary to consider carefully the cost factor when adopting canister packaging so that the product can remain competitive in the terms of pricing, while also gaining the desired benefits. Related to this particular cost, there is also a risk of resistance from price-sensitive customers and also dependence on suppliers that are capable of producing food-grade canisters for MSMEs. Communication and careful consideration remain the key to avoid these risks when adopting canister as packng for *kembang goyang*.

The selection of canister as the packaging can also be further explained using the 5W + 1H framework. The selected packaging alternative is food-grade canister, designed to protect brittle snacks such as *kembang goyang* during its distribution processes through e-commerce. It was selected because it has the highest score when measured through AHP analysis, considering the quality of product protection, mechanical strength, cost, eco-friendliness, and convenience. These criteria are considered important to enhance the product's e-commerce readiness, particularly to ensure it remain intact through the distribution processes. The primary stakeholders involved in the AHP analysis are *kembang goyang* MSME producers, e-commerce consumers, and academic experts. The usage of this packaging alternative for *kembang goyang* especially becomes important when the MSME wants to expand beyond their regional market and sell the product through e-commerce, with the risks of product damage during the delivery processes. Implementing this alternative can be done by selecting food-grade canisters and integrating branding elements in the designs of canister to convey the added value to the customers. This decision has been justified by the consistency between expert judgements, the criteria weights, and the overall result of AHP analysis.

There are several managerial implications for the stakeholders from this study. First of all, for MSMEs, using canister packaging for *kembang goyang* can reduce the risk of product damage during the distribution processes through e-commerce, potentially lowering return rates, minimizing customer complaints, and improving customer satisfaction. For SME development agencies and local governments, the findings showcase the importance of supporting packaging innovation through training programs, shared procurement schemes, or financial incentives to help MSMEs adopt a more protective packaging with minimal cost burdens. There is also an opportunity for packaging suppliers to develop affordable and customizable canisters especially designed for the needs and productions scales of MSMEs for traditional brittle snacks such as *kembang goyang*, expanding their market reach.

This research contributes to the body of knowledge by involving packaging selection in the matters of consideration for e-commerce readiness, instead of treating the product packaging as purely technical or aesthetic decisions. It also extends the application of AHP beyond evaluating which traditional snack product can be considered as regional flagship product, by evaluating what kind of packaging is best to be considered to market said regional flagship product to other regions. By focusing on brittle snacks such as *kembang goyang*, this research highlights the practical challenges faced in real-world e-commerce logistics and provides a decision-making framework to handle said challenges. The BOCR analysis and managerial implications also provide the practical relevance of the findings, offering actionable insights for both industry and policymakers.

5. Conclusion

The aim of this research is to identify the most suitable packaging alternative for improving the e-commerce readiness of *kembang goyang* using the Analytical Hierarch Process (AHP). Based on expert judgements, product protection and mechanical strength have been identified as the most important criteria in choosing the packaging, followed by cost, convenience, and eco-friendliness. Among the alternatives, canister packaging achieves the highest overall score, followed by plastic jar, vacuum standing pouch, and boxed plastic tray. The rigid structure of canister packaging enables better protecting of the *kembang goyang* during delivery processes, thus maintaining the product integrity and lessening the risk of product returns. These findings suggest that MSMEs focusing on selling brittle snacks, when aiming to expand using e-commerce, should consider packaging solutions that emphasize product protection and mechanical strength rather than cost alone.

Based on this research, it is recommended that MSMEs selling *kembang goyang* in South Tangerang consider adopting canister packaging to sell the product through e-commerce channels. Support from related stakeholders, such as local governments or SME development agencies, may be needed to reduce cost barriers through training, packaging standardization, or collective procurement schemes. This research can be expanded in future studies by adding more criteria, such as aesthetic aspects or customer perception analysis. There is also the possibility of testing the decision model with broader expert groups.

6. Daftar Pustaka

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