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Fritter packaging design to increase the sustainability of micro, small, and medium enterprises

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ABSTRACT

Fritter is the traditional food of the people in Indonesia and is very popular and well-liked because of their crunchy, delicious taste, not to mention the affordable price. Fritters are generally sold by street hawkers, a type of business categorized as micro-enterprises. Due to the COVID-19 pandemic, fritter sellers have experienced a drastic drop in sales, because buyers doubt the hygiene of the fritter offered, especially the packaging used. Micro, small, and medium enterprises are the target of the Indonesian government to be supported and empowered. To maintain the sustainability of their business, the efforts that can be made are to design packaging that ensures food hygiene and accommodates customer needs. The design of packaging for the fritter is done based on interviews and the Quality Function Deployment method to accommodate customer needs. The new packaging is designed using thin cardboard covered with kitchen tissue. This packaging improves the function of ordinary packaging, which is more hygienic, absorbs oil and moisture, can be closed tightly, is more durable, and can store leftovers that are not eaten immediately. The packaging is also more eco-friendly because it eliminates the use of plastic bags. Not much research has been done on fritter packaging, so this research is expected to contribute to providing better fritter packaging.

Keywords:

packaging design, sustainability, Quality Function Deployment, hygienic, eco-friendly

Introduction

The COVID-19 pandemic has caused changes and suffering in most countries around the world. When the pandemic took place, many countries in the world took social distancing measures for their people. Even though the pandemic has started to subside, and activities are starting to return to normal, it turns out that this pandemic has influenced the economy [1]. This happened because most people have concerns about COVID-19, so they limit themselves to activities related to using public facilities and buying food. Related to the aforementioned, Micro, Small, and Medium Enterprises [MSMEs] are business units that are heavily affected by this condition [2,3]. They experience a decrease in income [2,3]. A continuous decline in sales can cause MSMEs to be unable to sustain their businesses, whereas they have strategic roles to support the economic condition and people's welfare in a country [3,4]. Hence, MSMEs need to be supported so that they can be sustained.

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One of the affected MSME businesses is fritter street hawkers. Fritters are traditional food made with various basic ingredients, covered in flour, and then fried. The main ingredients of fritter are natural ingredients that are easy to get and cheap so that people from all economic levels can enjoy fritter. The fritters commonly sold in Indonesia are fried bananas, fried sweet potatoes, fried tofu, fried sticky rice, and tofu stuffed with carrots and bean sprouts. Some fritters can be seen in Figure 1. The most popular and preferred fritters in Indonesia are the so-called *bala-bala*. *Bala-Bala* is made from sliced cabbage, carrots, and bean sprouts, then seasoned and mixed with flour before being fried. In Indonesia, fritter is a popular food and preferred by all levels of society, easily found, as well as cheap. That is why fritters becoming popular and favorite food for various levels of society. Usually, fritters are sold by street hawkers, although some restaurants or cafes are also selling fritters.



Figure 1. Fritter

Food packaging has many functions. One of the important functions is to protect the food [5], [6] in terms of hygiene, quality, and shape. Another function, packaging can influence the perceived quality and brand preference of food products [7]–[10] to support marketing efforts. In addition, the packaging design is also expected to reduce the environmental burden of disposing of food packaging [7,9,10] while reducing wasted food [9,11] caused by stale food. This issue is so popular that there are researchers who are researching sustainable packaging [12], edible packaging [13,14], and smart packaging [6], [17] for similar reasons. Considering the importance of food packaging, it is necessary to design packaging that can fulfil the expected functions. Food packaging that is designed must also be suitable for the ingredients, form, and characteristics of food to be packaged. The serving suggestion of the food also differentiates the need for packaging.

This research intends to help fritter street hawkers keep their businesses sustainable by increasing their income by designing the proper packaging. Customers who do not want to buy fritter are mostly concerned about the hygiene of the fritter because currently, the packaging utilises used paper, which is formed into bags, as can be seen in Figure 2. This paper was far from hygienic. The paper was used for any document, frequently containing writings or print with ink that should not be consumed, used by multiple people, or transferred to some people, sometimes it has been stored for a long time in a place that is not necessarily clean, not to mention paper material that is most likely not classified as food-grade. The next concern is that the fritter is processed by frying, and often the sellers of the fritter do not drain the fritter properly before being packaged, causing fritters can cause coughing or

sore throat, to the risk of elevated blood cholesterol. The design made in this study aims to overcome these things, resulting in better fritter packaging.



Figure 2. Fritters Street Hawker's Packaging

Up until now, much research on food packaging design can be found, such as frozen fish crackers [15], strawberry and agro-based materials [16], chocolate [17], and coffee [21]. In Indonesia, there was also research to design packaging for colenak [10]. Colenak is a traditional snack from Bandung, made from fermented cassava grilled over a direct fire, then doused in melted brown sugar and sprinkled with grated coconut. The research [22] discusses packaging innovation for foods and beverages, also there was research on food packaging for SMEs in Malaysia [23]. So far, research about packaging for fritters is not yet available. In this study, apart from the unique design form, the design began with identifying customer needs, so the design is indeed oriented to customer needs. This study utilized qualitative and quantitative methods. Qualitative methods are used by conducting observations on the use of packaging and interviews with fried food traders and customers to find out customer needs, while quantitative methods are used by distributing questionnaires to find out the level of customer interest and customer satisfaction in building a House of Quality. Fritter's packaging needs to be designed to meet customer needs. Thus, it is hoped that customers will be more interested in buying a fritter because they do not doubt the hygiene and condition of the fritter when they are taken home or delivered. With the willingness of customers to buy, the fritter street hawkers get a better income and maintain the continuity of their businesses, which is expected to reduce unemployment and improve people's welfare.

Methods

This research designed fritters' food packaging for MSMEs. The research framework is shown in Figure 3. The research begins with a preliminary study. In this preliminary study, researchers observed the condition of fritter street hawkers impacted by the COVID-19 pandemic. Next, researchers identified and formulated the problem. The problem to be solved in this research was how to increase fritter street hawkers' income through designing packaging for fritter street hawkers.

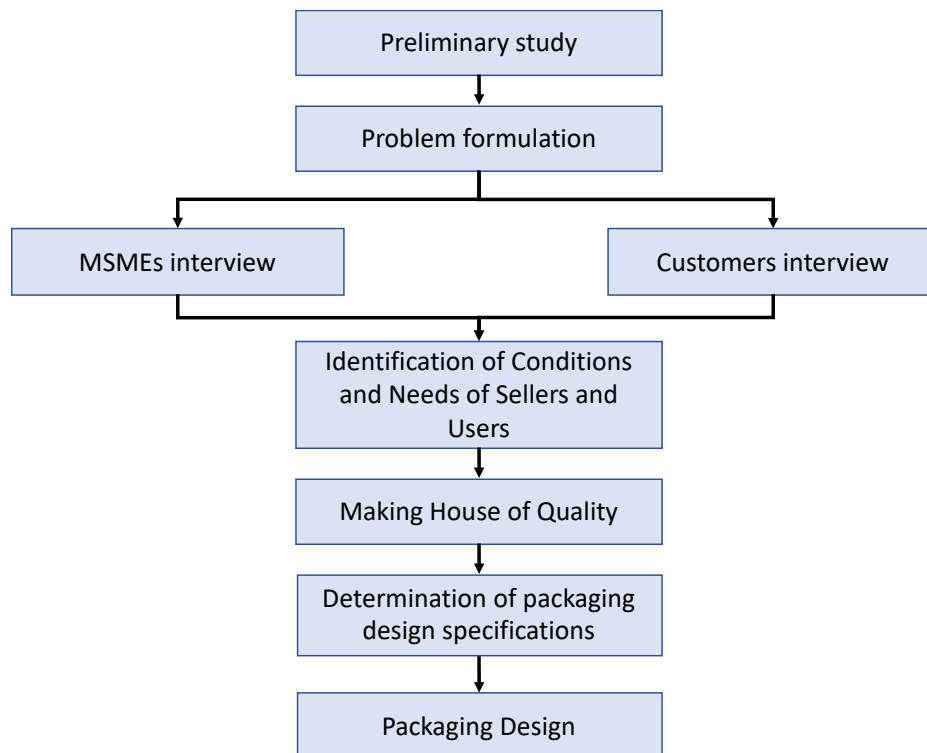


Figure 3. Research steps

This research applied qualitative and quantitative methods. The qualitative method was used to find the root cause problem of the decreasing income of fritter street hawkers. The qualitative method was also used when researchers initially looked for the customer need variables. This method was done by interviewing fritter street hawkers and fritter customers. This interview aims to identify the conditions of these MSMEs and find out the main cause of the decrease in income. It was found that the fritter packaging made customers worry about food hygiene and safety from the transmission of the COVID-19 virus. So, the researchers used the qualitative method to find out the pre-existing packaging used, and customer expectations towards the packaging used. Furthermore, interviews were conducted to find out customer needs for the packaging. The results of the interviews are compiled into customer needs. For qualitative methods, the number of respondents is determined by data saturation [19]. Saturation is when the addition of respondents no longer adds new information. At that time, data collection was stopped. Data validation is done by triangulation by comparing data from various sources. Here, a comparison was made between the results of interviews with several hawkers and with several customers and was found to be valid.

The quantitative method was used to find the importance of each customer's needs and customer satisfaction with pre-existing packaging. The quantitative method was done by administering questionnaires to customers to see the importance of customer needs and customer satisfaction with pre-existing packaging. The sampling technique used was purposive sampling with the criterion that the respondents were customers who had ever bought a fritter to take home and were aged 17 and above so that they know exactly about the packaging.

The quantitative method results were used to determine the customer needs of the House of Quality (HOQ) in the Quality Function Deployment (QFD) [20,21]. Using HOQ, design characteristics, the relationship between design characteristics and requirements, and the relationship between design characteristics, were determined [27]. HOQ was assessed by customers who have purchased

takeaway fritters. Next, initial target specifications were determined according to predetermined customer needs and design characteristics. Once the specification was set, packaging for MSMEs was designed according to the specifications which accommodated customer needs, and importance to customers, while considering correcting existing packaging deficiencies.

Results and Discussion

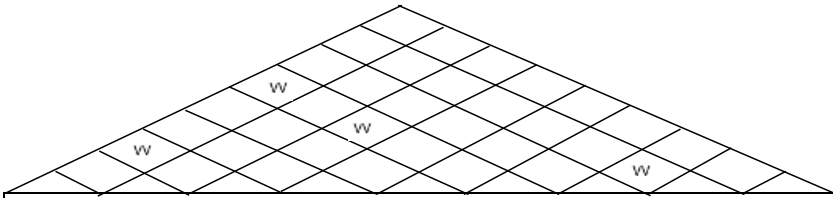
In the preliminary study, first observed and interviewed 6 fritter street hawkers about what happened to their business during the COVID-19 pandemic and after COVID-19 subsided. They stated that fritter sales dropped drastically during the pandemic, and increased slightly when COVID-19 subsided, but were still much lower than before the COVID-19 pandemic. Next, we interviewed 11 consumers to find out why they did not buy or reduce their purchases of fritters during the COVID-19 pandemic and after the pandemic subsided. Consumers stated that they were reluctant to buy fritters, especially those sold by street hawkers because they doubted the hygiene, cleanliness, and safety of the packaging. Especially during the pandemic, consumers were worried about contracting COVID-19 through fritter packaging. Respondents (fritter sellers and consumers) were also asked about pre-existing fritter street hawkers' packaging, especially the disadvantages, and the expectation of new packaging design to confirm the predetermined problem. We interviewed both fritter sellers and buyers to get views from both parties and accommodate both needs. The findings would be basic to design new fritter packaging.

Identify Conditions and Needs of Sellers and Users

Based on the recapitulation of interview results, the variables constituting customer needs are shown in the first column of HOQ in Table 1 and Figure 4. Then, customer needs were compiled into a questionnaire to determine customer satisfaction with existing packaging and the importance of each aspect of customer's needs from the customer's point of view. Customer satisfaction is measured on a scale of 1 to 4 indicating very dissatisfied (scale 1), dissatisfied (scale 2), satisfied (scale 3), and very satisfied (4). The importance of a customer's need according to the customer is assessed on a scale of 1 to 4 indicating very unimportant (scale 1), unimportant (scale 2), important (scale 3), and very important (scale 4). The customer satisfaction questionnaires were distributed to customers via Google Forms, and 123 respondents were obtained to give their opinions. The importance of each customer's needs from the questionnaire was included in the eleventh column in HOQ in Figure 4, titled IC (Importance to Customer), while customer satisfaction with pre-existing packaging (bags made of used papers) is included in the twelfth column, titled CoSP (Competitor Satisfaction Performance). In the thirteenth column, the goals are included. Goals were determined by rounding up the largest value between IC and CoSP and set for the new design packaging requirements.

Table 1. Customer needs

No	Customer needs
1	Packaging keeps the fritter hot
2	Packaging maintains the fritter condition (keep crispy)
3	The packaging can absorb oil
4	The packaging keeps fritter hygienic
5	The packaging can be used to store uneaten fritter
6	The packaging protects the fritters' shape

												
Design Characteristics/ Technical Response										IC	CoSP	Goal
Customer Needs	The packaging material retains heat	The packaging material does not retain moisture	Tight packaging	Packaging materials can absorb oil	Food grade packaging materials	Packaging can be closed	Strong packing material	Sturdy packaging design	Eco-friendly packaging			
Packaging keeps the fritters hot	9		9			3				3.28	2.14	4.00
Packaging maintains the fritters conditions (keeps crispy)		9	9			3				3.53	2.13	4.00
Packaging can absorb oil				9						3.46	2.30	4.00
Packaging keeps fritters hygienic			3		9	3			3	3.72	2.23	4.00
Packaging can be use to store uneaten fritters			3			9	1	1		3.18	2.37	4.00
Packaging protect fritters' shape							9	9		3.34	2.20	4.00
Score	36	36	96	36	36	72	40	40	12			
Priority	6.5	6.5	1	6.5	6.5	2	3.5	3.5	9			
Competitive benchmark	Waste paper	N/A	Folded end of pouch	N/A	Tidak ama Non-foodgrade waste paper	Folded end of pouch	Plain waste paper 60-80 gsm	Plain paper bag design, not sturdy	Use of plastic bags instead of paper bags			
Target specification	Thin cardboard	The inside of the bag is covered with kitchen tissue	The packaging is shaped so that it can be closed tightly	The inside of the bag is covered with kitchen tissue	Hygienic kitchen tissue	The packaging design closes tightly	Thin cardboard	The design of the packaging interlocks	The packaging has a handle so that it reduces additional plastic bags			

HOQ Construction

To meet customer needs, design characteristics or so-called technical responses were identified. In HOQ this was listed in the second to the tenth column at the top of HOQ. For each customer need and design characteristic, it was determined whether the relationship was weak, medium, or strong, which was listed in the relationship matrix between the two. This relationship was given a score of 9, 3, and 1 for strong, medium, and low relationships respectively. In the HOQ, this matrix was listed in the centre of the HOQ. Next, there are scores located below each characteristic of customer needs. The scores were obtained by summing up the multiplication result of the relationship score in the related column with the suitable goals of each row. This score shows how much the particular technical response contributes to the design. The higher the score, the more it needs to be prioritised to be met first. Then, the next row or the below row includes priority in the form of the rank of the score for each column. The ranking was arranged from highest to lowest score. Rank is also used to determine which technical response should be prioritised when there are 2 or more technical responses that contradict each other. From HOQ in Figure 4, the highest priority goes to tight packaging, considering the highest score resulted.

Determine Packaging Design Specification

Below the priority, in Figure 4, the competitive benchmark is included. This line is filled with the current packaging conditions for each technical response. This line is the benchmark in determining new design specifications. The pre-existing packaging was made from used paper, as seen in Figure 2. Below the competitive benchmark, there is a target specification row. In this row, the specification of the new packaging design was determined for each design characteristic, considering the customer's needs and the deficiency of the pre-existing packaging. The new street hawker fritter packaging was designed based on the target specifications listed in the HOQ.

Packaging Design

The next step was designing the new packaging based on the specifications determined. The new packaging was made from thin cardboard, avoiding used paper usage to improve the hygiene of packaging, while also improving the function of packaging to protect the fritter. To absorb moisture and excessive cooking oil, the inside side of the package was lined with hygienic kitchen tissue. In addition to materials, the fritter packaging shape is designed to improve its functionality compared to the pre-existing packaging. The packaging was designed to be assembled and closed tightly by tucking. The packaging was also designed to have a handle to carry it, eliminating the need for additional plastic bags. This enhances the eco-friendly nature of the new fritter packaging.

The design pattern of the packaging before assembly can be seen in Figure 5. The wide area of the pattern is lined with kitchen tissue to absorb grease. To assemble, simply fold all of the lines and slip the protruding part into the corresponding snags to assemble the packaging. Figure 6 shows the shape of the packaging after assembly in opened condition, people can put the fritter into the packaging through the open top side. Figure 7 shows the shape of the packaging after assembly in closed condition after the fritter entered. As shown in Figure 7, the packaging can be closed tightly, and a handle was available in a pattern and automatically formed after the packaging was assembled. To close the packaging, simply fold the top section of the packaging and tuck the protruding part into the snag that has been provided.

This research resulted in 2 kinds of designs and materials with the same form but provided in 2 different sizes of packaging. The smaller size is for 1 to 5 fritters, while the larger size is for 6 to 10 fritters. Two sizes are made to accommodate fritters better, while also making the use of packaging

materials more efficient, adjusted to needs. In Figures 5, 6, and 7, the figure on the left side shows the dimensions for large-size packaging, while the right side shows the dimensions for small-size packaging.

The new packaging design ensures fritters' hygiene because besides the packaging made from food-grade material, the packaging was designed to be tightly closed when first purchased and after the customer has eaten some but not finished. The packaging was also designed considering ergonomic aspects by providing 2 sizes, a hand grip for comfort handling the packaging, and a curved shape on the right and left sides to ease carrying it. Last, the hand-grip equipped in the design eliminates the plastic bag needed to carry fritters' packaging. With these packaging improvements, customers do not need to worry anymore about buying fritters from street hawkers. Then, hopefully, the fritters' sales increase and the hawkers' business sustainability can be maintained. On the other hand, the reduction of plastic bag usage also supports sustainability development goals.

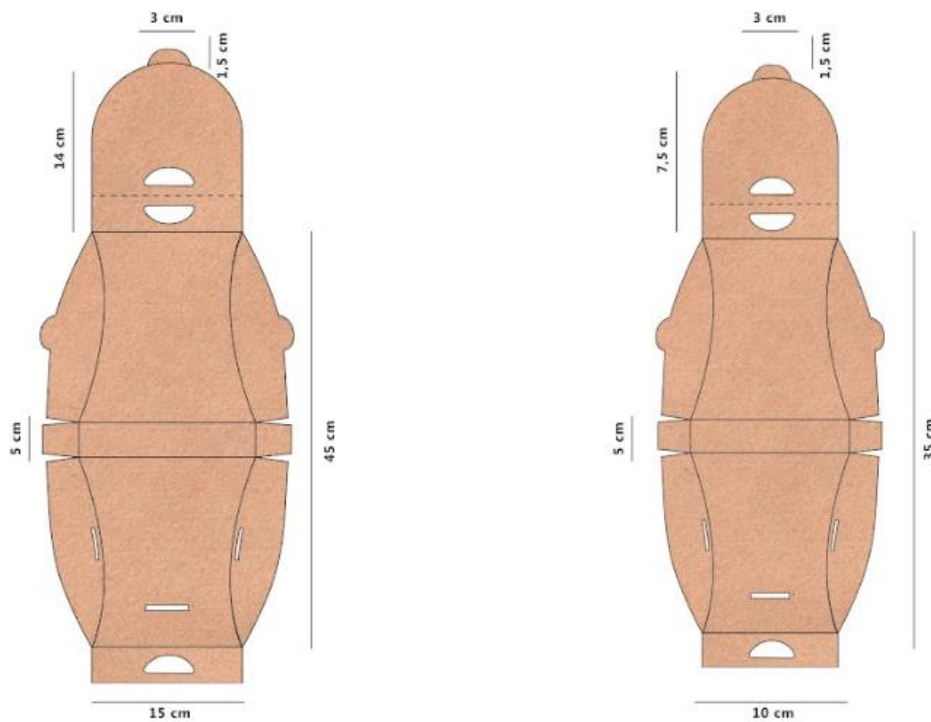


Figure 5. Fritter packaging design template

Conclusion

From the results of the research that has been conducted, it can be seen that the packaging of fried foods circulating in the market so far has not met consumer needs. The new packaging design was designed to improve the shortcomings of the previous design while increasing the environmentally friendly value of the packaging. With this new packaging, it is expected to increase sales and income of street fried food vendors, because consumers feel safer and more comfortable, especially in terms of hygiene.

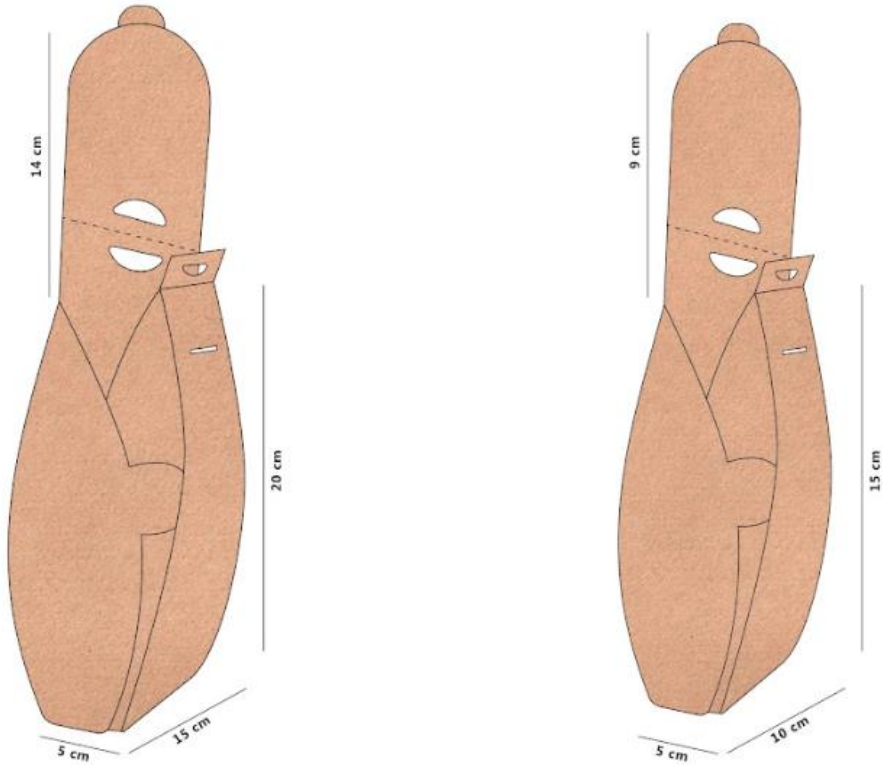


Figure 6. Fritter packaging in opened condition

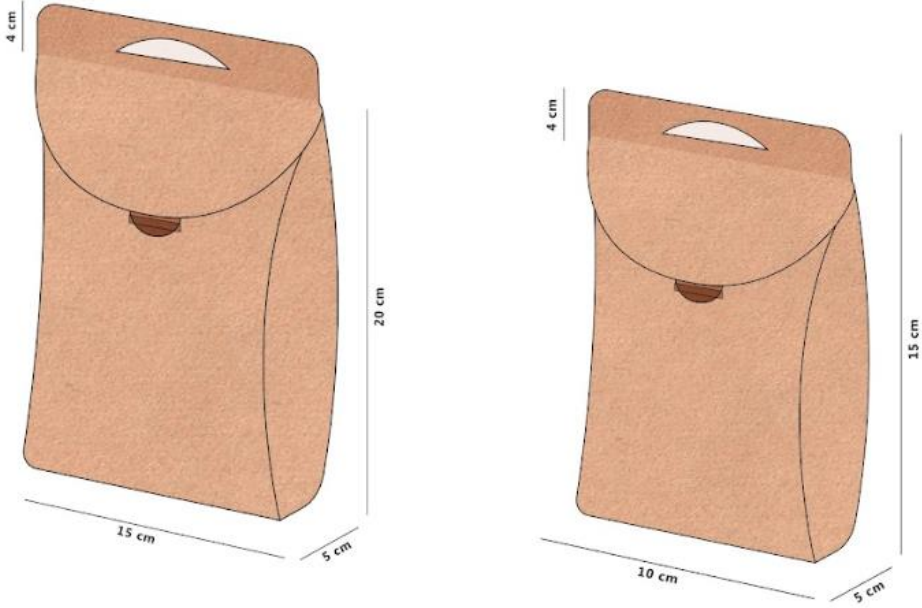


Figure 7. Fritter packaging in closed condition

From an academic perspective, this study shows that qualitative and quantitative methods can be used together and complement each other for product design. Qualitative methods are useful for finding customer needs for fritter packaging, while quantitative methods are useful for measuring respondents' attitudes about predetermined customer needs.

For further research directions, research can be continued by considering packaging costs. In addition to considering costs, research can also be conducted to conduct value engineering, to ensure that packaging design can be carried out at the most optimal cost. Research can also be continued by compiling various types of other packaging designs with various shapes and materials so that various designs and packaging materials are obtained as alternatives. On the other hand, research can also be conducted to improve sustainability in packaging which will improve environmental, economic and social performance along with the constraints that may be faced [28].

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