



UNIVERSITI PUTRA MALAYSIA

***THE EARLY STAGE DEVELOPMENT OF STRATEGIC APPROACHES IN
THE INNOVATION OF MALAYSIAN TRADITIONAL FOOD SYSTEM***

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ABSTRACT

Malaysian traditional foods are known for their unique and diverse flavours. They represent our cultural background and have high potentials to be marketed worldwide. However, their potential values might be hindered due to the lacking of several factors such as low commercial aesthetic value, and small production scale. Hence, this study aims to develop of a strategic approaches for the innovation of traditional food system. This project has been divided into two important parts; 1) development of the innovation system; and 2) evaluation of the innovation system. For part 1, the system has been developed based on 3 stages namely, pre-assessment, innovative principle application and post-assessment. For each stage, an assessment rubrics have been developed to assess the food sample. Different rating scales will give different meanings for the food assessment. Part 2 of the project touched on the testing of the system on ten selected commercialized Malaysian food. The same system was also used to develop a new innovated food product named as instant *laksam*. Based on the outcomes of this project, the system is proven to be a convenience tool to provide such a guideline for any food producers and researchers involving in the food product development activities to enhance the commercial value of Malaysian traditional foods.

Keywords: Traditional foods, strategic approaches, innovation, product development

ABSTRAK

Makanan tradisional Malaysia terkenal dengan rasa unik dan pelbagai. Mereka mewakili latar belakang budaya kita dan berpotensi tinggi untuk dipasarkan ke seluruh dunia. Walau bagaimanapun, nilai potensinya mungkin terhalang kerana kekurangan beberapa faktor seperti nilai estetika komersial yang rendah, dan skala pengeluaran kecil. Oleh itu, kajian ini bertujuan untuk membangunkan pendekatan strategik untuk sistem inovasi makanan tradisional. Projek ini telah dibahagikan kepada dua bahagian penting; 1) pembangunan system inovasi; dan 2) penilaian system inovasi. Untuk bahagian 1, sistem inovasi ini telah dibangunkan berdasarkan 3 peringkat iaitu, pra-penilaian, aplikasi prinsip inovatif dan penilaian pasca. Untuk setiap peringkat, rubrik penilaian telah dibangunkan untuk menilai sampel makanan. Skala penilaian yang berbeza akan memberi makna yang berbeza untuk penilaian makanan. Bahagian 2 projek menyentuh pengujian system terhadap sepuluh makanan Malaysia yang dikomersialkan. Sistem yang sama juga digunakan untuk membangunkan produk makanan inovatif baru bernama laksam segera. Berdasarkan hasil projek ini, sistem terbukti menjadi alat kemudahan untuk menyediakan garis panduan sedemikian bagi mana-mana pengeluar dan penyelidik makanan yang terlibat dalam aktiviti pengembangan produk makanan untuk meningkatkan nilai komersial makanan tradisional Malaysia.

Kata kunci: Makanan tradisional, pendekatan strategik, inovasi, pembangunan produk

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CHAPTER 1

INTRODUCTION

1.1 Background

Traditional food is foods or dishes that have been inherited for a long generation. It is normally considered as one of the national cultures and can reflect as a powerful national spirit symbol. Usually, the traditional food is made by the expertise of local people in a specific local community by using local ingredients. People in the community produced traditional food as homemade food. The older generation originally owned any specific traditional food recipe, and it is passed to the new generation. Due to its huge market value, some entrepreneurs who have the skills to prepare traditional food take the opportunity to produce the food for commercialization. This includes some large food processing manufacturers or culinary services in the hospitality industry.

In an effort to preserve our culture, the National Heritage Department or *Jabatan Warisan Negara* (JWN) has implemented a program that records all documentations and researches related to Malaysian traditional food. There are 213 Malaysian traditional food has been declared under Act 645 of the National Heritage Act 2005 as intangible heritage objects (*objek-objek warisan tidak ketara*) (The Commisioners of law Revision, 2006). These include some of the most Malaysian popular food such as *Pulut Durian*, *Bubur Lambuk*, *Kuih Ros*, *Capati*, *Budu*, etc. This effort is made to ensure Malaysia's current and future generations have the chance to enjoy these foods.

In Malaysia, fourteen states have their own special traditional food. The traditional food in each region represents the culture and identity of the country. For instance, the cuisines in Negeri Sembilan are very famous for the spiciness with coconut milk such as *masak lemak cili api* and *rendang* (Salehuddin et al., 2013). The special recipe has a history behind it which originally came from the Minangkabau style. Apart from that, one the famous snack from the East Coast of Peninsular Malaysia is known as *keropok lekor* made from fish flesh and starch.

Meanwhile, layered cake (*kek lapis*) is a very common delicacy from Sarawak. The popularity of this traditional food is known all over the country and are mostly prepared from organic ingredients. Hence, some traditional foods contain many nutrients that provide necessary nutrients in our body, including proteins, fats, vitamins, and minerals. Accordingly, these nutrients help prevent and control diseases including diabetes, auto-immune disorder, obesity and others (Saunders et al., 2010). The majority of the food is healthy and natural because no preservative ingredients or chemicals are added to the foods that can diminish their nutritional value. Other than that, this food is very special because it has its own authentic taste, aroma and texture that is very different compared to the processed food.

It is reported that *Nasi Lemak* is considered as the most popular food among Malaysian. Through the study, they suggested that Malaysian traditional food needs to be preserved for the sake of future generations. Unfortunately, this type of food lacks in terms of commercial value these days. This is because people are more attracted to fast food or ready-to-eat meals due to their convenience, which suits their current lifestyle.

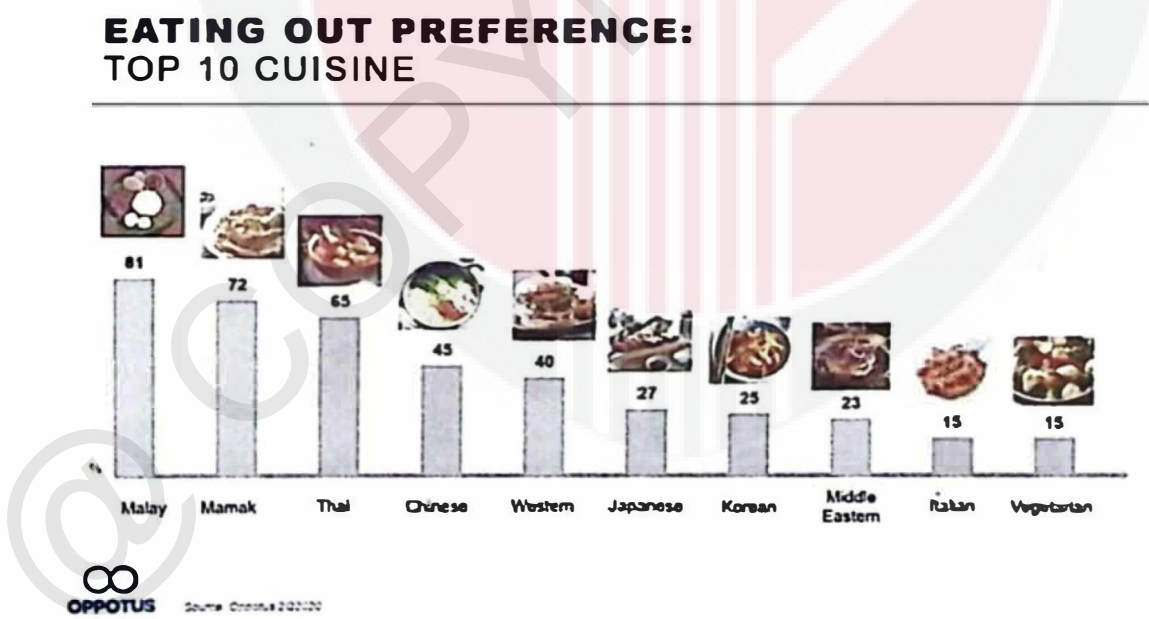


Figure 1-1: Malaysian food preference trends (Lee et al., 2020)

Figure 1-1 shows *Nasi Lemak* as the top option for Malaysian among other foods. Besides, the production of traditional food is mostly homemade or in a small scale setup. Mostly food producers lack of scientific knowledge and technological advancement to be incorporated into their business module. Nevertheless, the issue can be overcome through some practical strategies for the

innovation of the traditional food. With proper innovations, the functions, aesthetic characteristics, and convenience of traditional food can be improved for commercialization. Through this idea, the entrepreneur can expand their business for more venues of opportunities.

The practical strategies for innovating traditional food need to be established as guidelines for the food producers. To date, seldom efforts have been identified in the literature related to this effort. The guidelines may include some innovative steps, principles, and assessments to improve any specific Malaysian traditional food. Hence, the objective of this study was to develop strategic approaches for traditional food innovation and to apply the system in developing innovated food. The developed systems will also be tested on different commercial innovated traditional food. The findings from this system proposed innovation principles in this study which also lead to the proposing of a novel innovated traditional food which is instant *laksam*. The innovated *laksam* can be commercialized in the market compared to original *laksam*. The product has high commercial value and long shelf life compared to original *laksam* after going through some high technology processing.

This system can be used for all food developer who want to do the innovation or increase the value of their product. The user can started with the pre-assessment of their traditional products by using the prepared evaluation rubric based on ten criteria. If the results from the assessment shows their products needs innovation, the product will be assess in the next step by developing the innovation principle which consist of four principle; 1) modification of the formula, 2) integrating the with other product, 3) processing approaches of the product and 4) improve the physical characteristic of food. After the innovation process take place, the innovated product will be assess again by using the same rubric as the first step.

The development of the innovation system give benefits to the food producers or SMEs. They can refer to the main part in this system, the innovative principles as a guideline to get ideas on the innovation. From this system, it may help food developer or SMEs to improve their products by increasing the potential commercial of the system.

1.2 Problem statement

Traditional food is known as tradition that have a specific history in a population. It is usually produced by the older generations and rural entrepreneurs in a small market niche. Despite many attractive attributes related to Malaysian traditional food, however, there are a few limitations, including its commercial values compared to modern food. Most of them have faced a lot of obstacles to be successful entrepreneurs and grow their businesses. Traditional food is also produced by traditional methods with a small production scale. They have faced several constraints due to technical problems and poor manufacturing practices.

Other than food manufacturing, food packaging is also one factor that the traditional food lacks commercial value. Some of SMEs are lacking of exposure in marketing strategy. They are not exposed to the marketing education. The product needs to be upgraded through innovation to increase its commercial value since there is no established procedure to innovate the food.

In addition, these days some of the traditional food is only available in certain areas. Mostly the food or cuisines are produced only by a recipe from the old generation which only available at certain region. It makes the food low regional availability and not easily found in the market compared to other food that has a place in the food industry. The availability of these products is still low, especially in an urban area with less expertise in a traditional field.

Next, the limitation of traditional food is it has a long preparation time to produce. The preparation of specific traditional food required a high level of skill and this relies on people who are high knowledge in this field especially the older generation. Most people in this era have low skill in traditional food preparation, making it missing the convenience factor (shape, packaging, taste, etc.). They also busy with their commitment and focus on working life. They seem not interested in learning or producing traditional food since it consumes a lot of time for making. This is why the youngest generation usually has limited knowledge of traditional food and chooses to eat fast food rather than traditional dishes. Local and traditional food products are frequently made using established procedures that use techniques and expertise of the production (Ilbery & Kneafsey, 1999, p. 2208).

Based on the problem statement above, this research focuses on a strategic approach to produce innovated traditional food with the same taste but a different method. The traditional food will be evaluated before and after the innovation based on the criteria created in our system. This system functions similarly to the "guidelines" on producing better traditional products by solving all the above problems.

1.3 Objectives

This study aims to establish a system for the innovation of Malaysian traditional food. The specific objective are;

- i. To develop strategic approaches for the innovation of traditional food system, which consisted of three stages: pre-assessment, innovation principles, and post-assessment.
- ii. To self-apply the system in developing a novel innovated Malaysian traditional food.

1.4 Scope of study

The study is the research about the modification of traditional food into a better version of the food. The research is conducted by following the limitations that are stated in the problem statement in Chapter 1. In this chapter, I have provided the introduction and also explain the objective of this research. Chapter 2 discussed topics related to this study in details while Chapter 3 elaborated the methodology involved in conducting the project. The outcomes of this project have been divided into two parts;

Chapter 4: Development of Strategic Approaches for Innovation of Traditional Food System

- 1) There are three phases in the study: start from phase 1; development of the pre-assessment product. A form of rubric is created to evaluate the criteria of the original traditional food to find the limitation and point to be improved.
- 2) Next is phase 2. Based on the limitation from the original products, some principles can be developed to increase the value of food. The principle is being introduced based on selected criteria; (a) formulation modification, (b) combination or integration of two products, (c) processing approaches and (d) physical characteristic of the products.. In each principle, a form of the rubric is prepared as score guidance to innovate the food.
- 3) For phase 3, the same evaluation form, a rubric, is used to evaluate the criteria of the innovated food. It is similar to phase 1 where the lowest marks represent poor products while the highest represent excellent products. This is the set for an indicator to detect whether the food achieves the target or not.

Chapter 5: Application of the System on the Malaysian Traditional Food Innovation.

- 1) Testing on selected innovated Malaysian traditional food. Ten examples of products in the market is explained and evaluated to show the effectiveness of the guidelines.
- 2) Applying on the development of a novel Malaysian traditional food.

At the end of this thesis, the whole summary conclusion and recommendation are being explained.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition of traditional food

Traditional food is a heritage food that represents the cultural identity of a country. The recipe of the food has been introduced since a long time ago by the older generations and pass-through from generation to generation. The production of traditional food is very special where it is made from the local ingredients. Besides, traditional food in every country has its own story and history based on their races, religion, or beliefs. In Malaysia, traditional food is famous among the community in rural area. Most of them produces their own homemade traditional food and it is being serve to their family. While some of them take the chance to strive in small business by opening their own street stalls or restaurant. Most of the small market entrepreneurs who have mastered making traditional food had chosen and tried to broaden their product exposure into the market.

In some countries, traditional foods were registered and protected with legal regulations to preserve their quality and food policies. Albayrak & Gunes, 2010 has investigated that in the European Union (EU), several regulations have been imposed to protect their traditional food. The regulations that are implemented are Article 2082/92, Regulations EC509/2006, EC 510/2006 and Regulations 1898/2006. The laws have been introduced to preserve the uniqueness and culture of the traditional dishes in their country. In his research, Albayrak & Gunes, 2010 traces the development of traditional foods in Turkey. They are one of the countries that refer to the EU applications procedure to have the same traditional food protection and EU regulations. It has been stated that EU registration is vital and important to be applied as a step to protect traditional food worldwide.

As in Malaysia, traditional food is protected by National Heritage Act 2005 under Act 625 (The Commisioners of law Revision, 2006). There are 213 traditional food are declared by the National Heritage Department. Through the research study, Salehuddin et al., 2016 stated that the roles of this department is to protect and preserve natural heritage food. Table 2-1 shows examples of traditional food conserved: Pulut Durian, Bubur Lambuk, Kuih Ros, Capati, Budu, Malay snacks such as Kuih Seri Muka, Ketayap *Kuih Karipap* and many others.

Table 2-1: Examples of Malaysia traditional food based on three major races

No	Malaysian Heritage Food	Examples
1	Malay Cuisines	  Examples: <i>Kuih-muih and nasi lemak</i>
2	Indian Cuisines	  Examples: <i>Idly and muruku</i>
3	Chinese Cuisines	  Examples: <i>Kuih bulan and mee kolok</i>

There are many types of food that are rich of taste and aroma. Each traditional food that defines cultural heritage food shows a different story and history. There is a study that research traditional food in Malaysia. In a recent research paper, Omar & Omar (2018) conduct a study about Malaysian Heritage Food (MHF), which explains Malaysia's historical view of food. Their research explains that Malaysia is a country with a multi-culture that can be classified in three main ethnic groups. It consists of three different food cultures inherited from the past generations: Malay, Chinese, and Indian food. The studies presented examples of these three different races. One of it is *Nasi Lemak*, which can be classified as one of the famous dishes in national dishes. The recipe of rice with coconut milk and spice sauce makes the taste very special. Other than that, there is one of the famous Indian traditional food which is *Muruku*. From the mixture of rice flour and urad flour form a fried snack is very crispy. This is one of the food that must have during festival ceremony especially Deepavali celebration. Next, special dishes from Chinese traditional food which is *Mee Kolok*. The food is very popular Peninsular Malaysia where it is being served with springy noodles in savoury soup. The addition of beef meat or chicken meat in the soup is very perfect to be served with the noodles.

2.2 Characteristic and types of traditional food

Traditional food is food that is made by local ingredients with their own creation. The characteristic of the food is natural and rich with local flavour. The food production follows traditions that are not into modernization and have a different character in their traditional food. The uniqueness of the food is one of the most appealing features of tourist attractions in the country. It may be one of the main attractions as it has a special and authentic character in the food which can provide the basis of branding and marketing activities for traditional foods (Faulkner, 2018).

For example, Mardatillah (2020) has done a case study on the culture heritage of Minangkabau cuisine in Indonesia. In her research, she mentions that one of the attractive foods in Southeast Asia come from Indonesia, which shows a spiciness meat dish known as Rendang. This food is being cooked with meat whether chicken, beef or lamb. The recipe of Rendang dish is very perfect combination with local ingredients which are spices and coconut milk. The studies also explain the cultural identity of the Minangkabau cuisines as heritage attractions in tourism industry.

The National Heritage Department (JWN) was trying to pursue United Nations Educational, Scientific and Cultural Organisation (Unesco) recognition for heritage foods. There are several types of traditional foods: dishes, desserts, and snacks listed in the National Heritage Department. Table 2-2: Traditional foods classified under three major races in Malaysia (Elis, 2009) below shows some of the examples of Malaysian Heritage Food based on types of food.

Table 2-2: Traditional foods classified under three major races in Malaysia (Elis, 2009)

Types of traditional Malaysian food		
Dishes	Desserts	Snacks
<i>Nasi Lemak</i>	<i>Kuih Sata</i>	<i>Keropok Lekor</i>
<i>Nasi Ayam</i>	<i>Tapai</i>	<i>Akok</i>
<i>Pulut Kuning</i>	<i>Kuih Bingka</i>	<i>Karipap</i>
<i>Nasi Kerabu</i>	<i>Cendol</i>	<i>Tapai</i>
<i>Nasi Dagang</i>	<i>Dodol</i>	<i>Bahulu</i>
<i>Roti Canai</i>	<i>Kuih Kapit</i>	<i>Muruku</i>
<i>Ketupat</i>	<i>Bubur Kacang</i>	<i>Pisang Goreng</i>
<i>Mee Kari</i>	<i>Kuih Cincin</i>	<i>Pulut Panggang</i>
<i>Laksa</i>	<i>Kuih Pau</i>	<i>Wajik</i>
<i>Rendang</i>	<i>Yee Sang</i>	<i>Roti Jala and etc...</i>

2.3 Advantages and disadvantages of traditional food

The benefits of traditional foods is healthy and have a lot nutritional values. Traditional food is made from a natural ingredient that is organic and has no chemicals or additives. The source of making the food originates from the land and gives a lot of nutrients to the consumer. A study found in 43 Arctic communities where the people that ate traditional food have better diets than ate market foods only. This is because many benefits are included in the diets which are the food sources have fewer calories. It will help the consumer in weight control and have better diets. Some traditional food also less saturated fats which are good for our heart. Consider the example of the *Thosai*, *Indian* cuisines which is made from healthy ingredients and will be served with sambal. The research found that it has low calories under 200 calories which low the risk for heart diseases. As stated in the journal by Environmental Stewardship Unit, (2007), the consumption of traditional food benefits the first nation's health. The written also explain about the traditional diets of animals and plant which provide energy to humans. They said that a traditional diet could be one of the reasons to protect humans from chronic diseases such as heart disease and others.

Traditional food also has several disadvantages which are stated in the problem statement. Preparation of certain traditional food is quite complicated and need a long time to prepare food. This is because people in the community nowadays have lack skills in traditional food preparation. Mostly, people use technology to prepare the food since it is more easy and simple. The study about Malay traditional food preparation was carried out by Shariff, 2017 which discusses the research on people in Sarawak. Through his study, he found that people in Sarawak lack of skills in making their traditional food. As an example, the famous traditional food in the community is *kelupis*. In the report, it was stated that *kelupis* is not so complicated to be produced, but the food ingredient is very difficult to find. Therefore, the young generation had problems in choosing the best ingredients to be used in the food. They had limited skills and not being exposed to traditional food. Figure 2-1 shows some opportunity and disadvantages of traditional food.

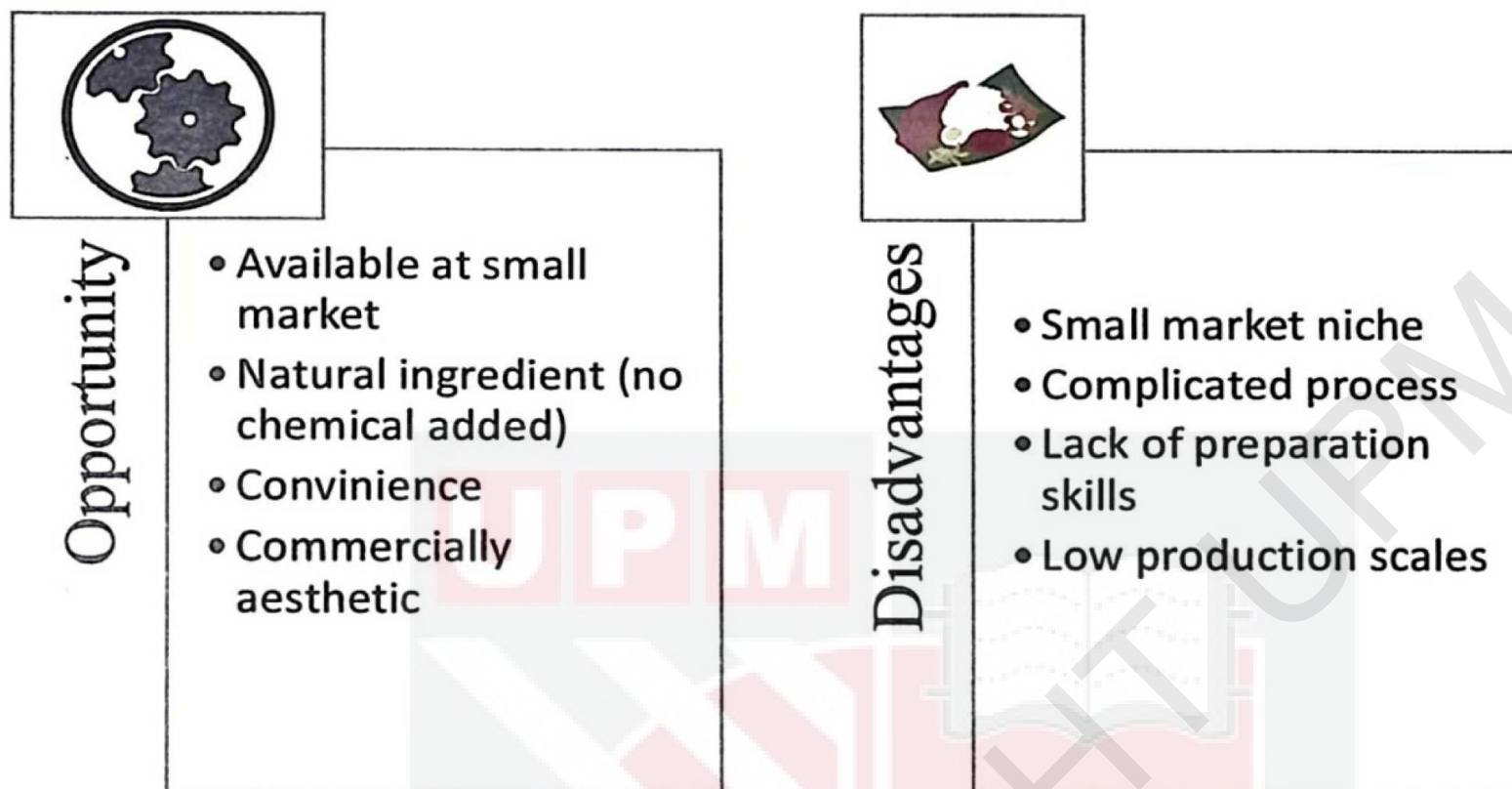


Figure 2-1: The difference on the advantages and disadvantages of traditional foods

The witters also explain several limitations from food preparation, which are they lack exposure in the preparation process. This is because the younger generations not interest to learn about traditional food. They also lack involvement in the kitchen since their parents are controlling all the food preparation. Most of the youngest generations choose fast food or ready-to-eat food because it is easy and simple. Then, the making of traditional food also affects in time-consuming. As an example, the making of *ketupat* during Eid Adha's celebration takes a long time of preparation since it is a bit complicated to produce. The beginning of the preparation which is to form the *daun palas* will take time and use skills. Most of them lack patience to do complicated things step by step.

From the study, we can see that the disadvantages of traditional food in the community. The young generation does not have intention to learn more about traditional food. They can see the complicated preparation of certain food and assume all traditional food are hard to make. This is why traditional food needs to be improvised and modern so the youngest generation has more interest in choosing traditional food. It can be referred to as the development of fast food or ready-to-eat food in the country.

2.4 The development of innovated food

In this research, the development of the innovation principle and concept will be introduced in several specifications. There are many aspects that can be considered to form a successful food innovation. The idea of innovation food must contain attractive elements or benefits to be consumed by people. Other than that, the innovations must also be clever and creative so that the products will meet high customer demand in the future. Many researchers were successful in producing their innovation products with positive acceptability by the consumers.

In order to produce modern processed food from traditional food, formulation modification is one of the important things which needs to be considered. Formulation of any particular foods may affect the products' quality attributes, including physical appearance, texture, nutritional value, etc. The modification of traditional food formula may involve several approaches such as enrichment and fortification. The addition of fortification in foods needs to be implemented to increase health benefits and improve the quality of food.

Ganesan et al., (2014) has reported that researchers have been made to add the high omega-3 polyunsaturated fatty acids (ω -3 PUFAs) in foods such as bakery products. They improved the bread by adding inappropriate amounts that are suitable to recommend daily consumption. The different types of fat are added to the bread to enhance the health benefits for the consumer. The sources of fortification come from the ingredients such as dairy products and eggs. The study has been made by fortification technique, in which the same technique can be applied in the traditional food.

Besides, an organization has implemented multiple fortifications with iodine, iron and vitamin A on cereal-based flour. The project was done with new approaches by following the Food and Nutrition Board of the National Research Council (1974) (L.Mahshid et al). The study shows that the fortification of sugar with vitamin A has been successfully implemented in several countries such as Central America in the 1970s. The implementation from other countries shows that this is also can be applied to Malaysian traditional food.

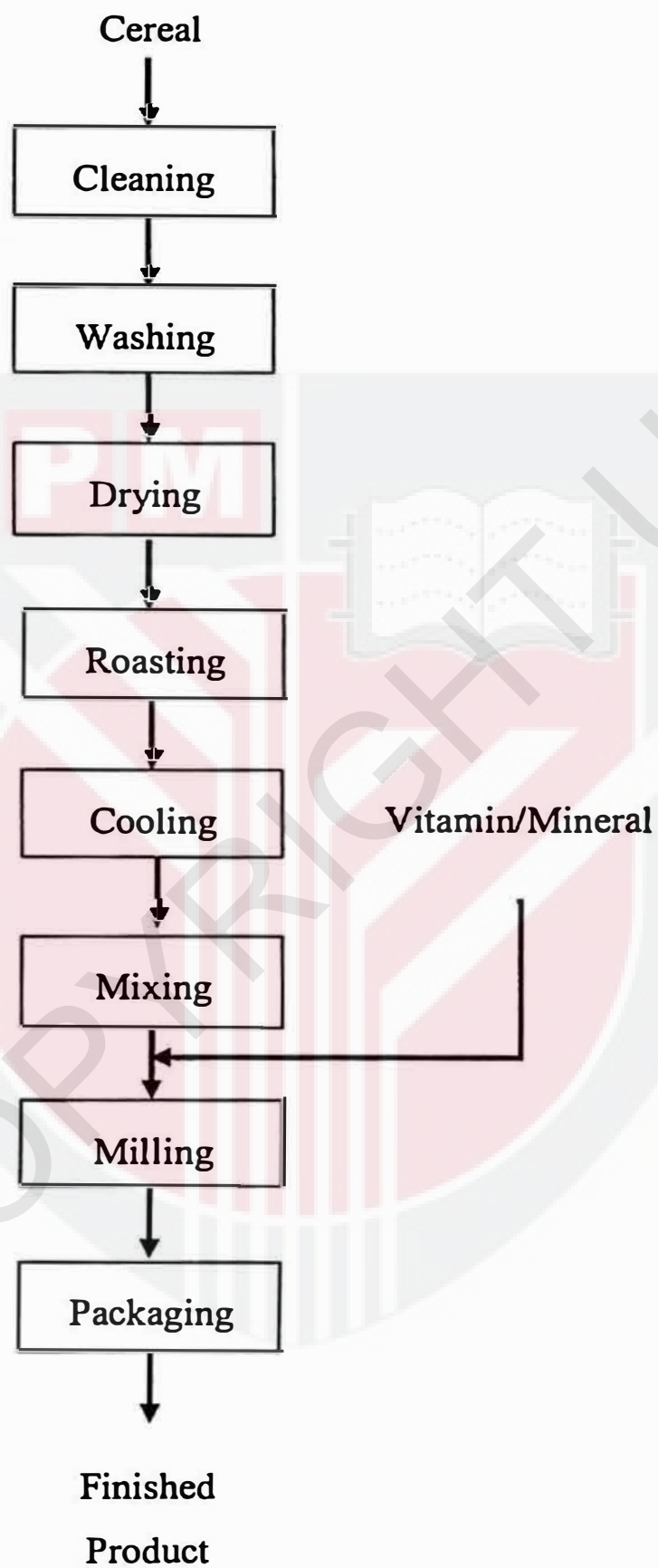


Figure 2-2: Flow chart “KIT approach” infant food manufacturing (L. Mahshid)

The formulation of traditional food can also be modified to change its physical characteristics. This needs to be done in order to match the recent taste palate among consumers. The innovation can be made to change the texture to become more smooth or springy or change the shape of the products. It can be done by refer to the suitability of the product's innovation. Another physical characteristic that can be included in the innovation is turning the colour or the parameter into a better version of products. There are several attempts have been made to produce innovation of products by changing their physical characteristics.

Fizman has evaluated the modification of muffins by the influence of adding four types of resistant starch to change its texture and color. The ingredient used for the muffin are wheat flour, sugar, egg, full-fat milk, refined sunflower oil, bicarbonate soda, citric acid and grated lemon peel. The other four types of resistant starch used in the experiment are RS types 2 which are Hi-Maize 260 and Novelose 240 and RS type 3, Novelose 330 and C*Actistar 11700. The five samples was tested by texture profile analysis (TPA) and Konica Minolta CM-3500d spectrophotometer. Table 2-3 is taken from graph result of primary TPA parameter in Fizman, 2009 studies.

Table 2-3: Effect of type of RS in instrumental hardness, springiness, cohesiveness and chewiness (Fizman, 2009)

TYPE	HARDNESS (N)	SPRINGINESS	COHESIVENESS	CHEWINESS (N)
CONTROL	4.85 ^a (0.86)	0.83 ^a (0.03)	0.63 ^a (0.03)	2.47 ^a (0.44)
HI-MAIZE 260	4.42 ^a (0.5)	0.79 ^{ab} (0.02)	0.56 ^b (0.02)	1.94 ^b (0.21)
NOVELOSE 240	4.73 ^a (0.27)	0.78 ^b (0.03)	0.54 ^b (0.02)	1.99 ^b (0.12)
NOVELOSE 330	4.61 ^a (0.56)	0.65 ^c (0.07)	0.55 ^b (0.05)	1.64 ^b (0.25)
C*ACTISAR	2.86 ^b (0.34)	0.75 ^b (0.03)	0.53 ^b (0.03)	1.64 ^b (0.25)

*Means (standard deviation) with the different letters are significantly different at $p < 0.05$ for each row

One of the starches used is C*Actistar, the retrograded starch from tapioca shows the biggest effect on the texture where the results show the muffin change hardness at the highest score. The texture has been explained by their hardness, springiness, cohesiveness and chewiness. The result has been discussed in the table by comparing the physical characteristic of each product with the addition of different types of resistant starch. Then, the color of the muffins also changes with a different result for each muffin. A spectrophotometer measured the color of the muffins to confirm the exact color changes. The result for the research shows the highest value color change the muffin with Novelose 240. The study proves that the modification of food has been made by changing their physical characteristic of food. The idea can be used to modify traditional food by changing its physical characteristic.

Another research found in changing the texture and sensory features of gluten-free muffin that is based on rice sourdough fermented with *Lactobacillus Spicheri* DSM 15429. The study conducted by Chiş et al. (2020) aims to produce better quality characteristics in bakery products manufacturing. The results from the uses of rice sourdough fermented with *Lactobacillus Spicheri* DSM 15429 in the products change their textural parameter where the hardness and cohesiveness of the products are decreased. It also improves the springiness and resilience of gluten-free muffins. From the discussion of the study, they found that rice sourdough can affect the texture of bakery products, which can improve the bakery's nutritional value.

Apart from that, the innovation can also be made by combining two different products or ingredients. The idea of multiproduct is to improve the taste of the products and increase the demand of the product. Previous studies have reported developing two products, whey cheese with pumpkin jam (Costa & Santos, 2012). The study is conducted in Portugal which is the country that is popular with any dessert consists of whey cheese and pumpkin jam that is being produced separately. The researchers come with an idea to combine these two favourite products and become a new product.

The development of this product is being observed in order to produce acceptable products by consumers. The discussion on the result of the evaluation of the parameters has been discussed in the research journal about the acceptability of the product by consumers. The survey shows that their development of new products shows positive results where most people can accept and like to eat this combination of the whey cheese with pumpkin jam. Through the modification of food, this concept also can be used in the innovation of traditional food. The perfect idea of the combination of two products may increase the demand for products.

Another innovation has been reported by Williams, n.d. about the combination of almonds and chocolate that turns out famous and successfully meets consumer demands. In his journal, he said that the innovation of the products changes the texture and taste into a different and better product. It is reported on the survey of the products gives positive feedback by the consumers. The result shows many emotional reactions such as happiness, cravings, and relaxation. The products have grown rapidly since it very satisfies the customer demand. This innovation of two products proved that consumers can accept the idea as long as the combination is suitable and perfect. Same goes for traditional food that has a different texture and taste. Another innovation of traditional food can be made in the future.

2.5 Examples of Innovated Malaysian Traditional Food

A few Malaysian traditional food have been undergone innovation to suit the current market. The innovation may come in terms of (1) modification of the recipe or formulation, (2) integration into modern food features, (3) modification of the processing steps mostly to ensure a longer shelf life and (4) physical improvements including textural and colour properties. Here describes are some examples of innovated Malaysian traditional food.

2.5.1 Kuih Kapit

Kuih Kapit is also known as *Kuih Sepit* or *Kuih Belanda*. It is traditionally made from wheat flour, rice flour, coconut milk, sugar and egg by using an iron mould to form the shape of food. Every mould is made up of two plates that are tightly clasped together and attached to long handles that can be used to manipulate them over a charcoal stove. However, the modern electric *kuih kapit* maker is currently in use because it is far simpler and less time-consuming than the traditional method. *Kuih kapit* is a similar waffle-like biscuit and very fragile and crispy. This type of food is suitable for all types of ages. It is usually made during festive seasons especially during Eid Fitri and Eid Adha.

In the market nowadays, *Kuih Kapit* is popular snack among Malaysian with the combination of chocolate, peanut and matcha filling in food. This food is usually eaten during breakfast and is famous during Hari Raya for Malay festival. Based on my observation, innovated *kuih kapit* is developed by principle 2 in our principle; (2) integration into modern food features. The combination of flavours in *kuih kapit* makes the food more interesting, modern and delicious. It is suitable to be consumed by children, teenagers and adults. Figure 2-3 shows the pictures of *kuih kapit* before and after the innovation process

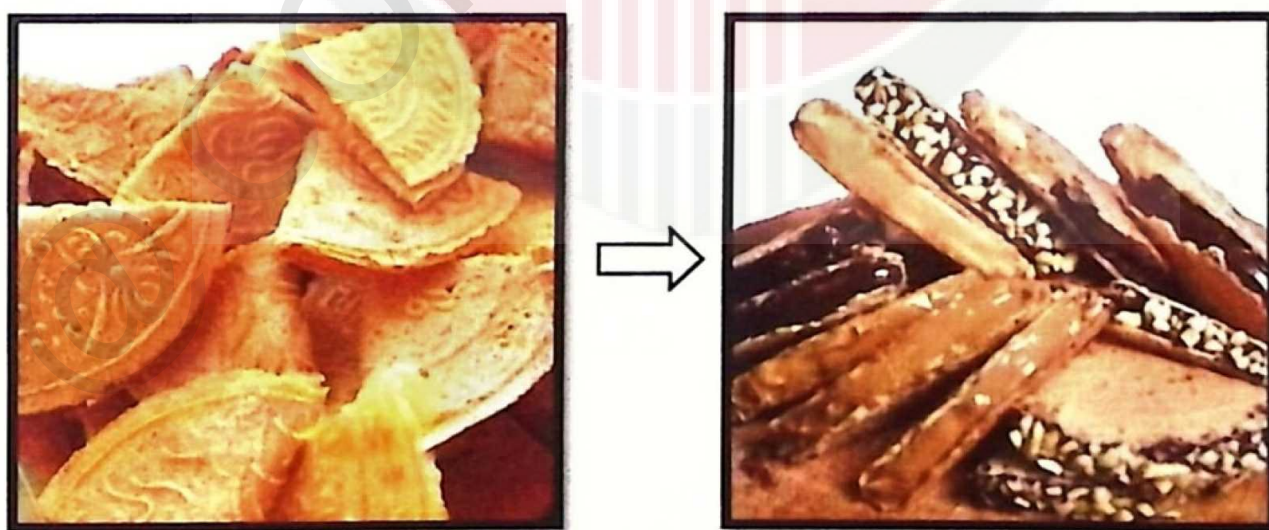


Figure 2-3: The innovations of original *kuih kapit* to chocolate *kapi*t and peanut

2.5.2 Keropok lekor

Keropok lekor is a popular traditional snacks that comes from the East Coast of Peninsular Malaysia. It is also made from other simple local ingredients including fresh fish, sago flour and salt. Traditionally, it is precooked by boiling in water. *Keropok lekor* is primarily found in Terengganu and in other states on the East Coast throughout Malaysia. Normally, people will buy *Keropok lekor* from local hawker stalls and the evening markets known as *pasar malam* in their town. Crackers also active in business among small entrepreneurs in their countries. They also called it Keropok Losong which is the name one village in Terengganu, Kampung Losong Haji Su.

Nowadays, some small entrepreneurs are very creative in innovating the crackers into something new. They integrate the crackers with cheese by using principle 2 in our system which is integration or combination of products. The producers of *keropok lekor* are becoming more creative in adding cheese as filling to make it taste better to fulfil customer's satisfaction. (The star, 2019). Through the innovation, customers can enjoy various flavours of *keropok lekor* instead of the original one. Figure 2-4 shows the pictures of *keropok lekor* before and after the innovation process.

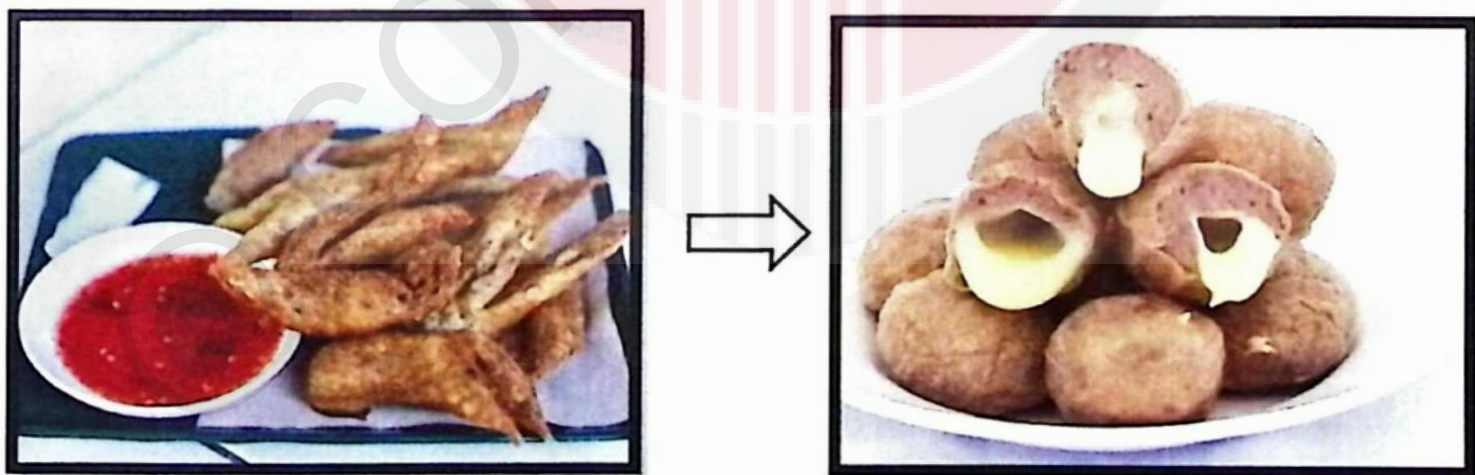


Figure 2-4: The innovations of *keropok lekor* to lekor cheese ball

2.5.3 Karipap

Curry Puff or *Karipap* is one famous heritage food in Malaysia which is made with clarified butter mixed together with plain flour. The mixing of both is rolled out and folded in half. This food is normally served as an appetizer as a tea time snack and is ideal for breakfast. Curry puff is a tasty snack that is loved by all ages in Malaysia. Curry puff can be found at many stores, including public markets, trendy cafes, and Malay, Chinese, and Indian food stalls. It is a small pie of thick curry potatoes held together by an egg pastry shell made from a simple pastry dough.

Today, some entrepreneurs create something different which combines another flavour in curry puff called *karipap karbonara*. The combination of western-style inside traditional food makes it interesting. They integrate the food by developing principle 2; integration into modern food features and form *karipap karbonara*. The savory filling inside karipap is made up from minced chicken, mushroom, carbonara sauce and cheddar cheese. All the ingredients make good replacements and modern. Figure 2-45 shows the pictures of curry puff before and after the innovation process.



Figure 2-5: Curry puff. The innovations of curry puff to karipap karbonara

2.5.4 Satar

Satar is a traditional food that is popular on the East Coast of Peninsular Malaysia, especially in Terengganu and Kelantan. *Satar* is made from a boneless fish and spice mixture that is cooked in banana leaf wrappers. *Satar* will then grill it in order for it to cook. Usually, *Satar* is processed by yellowstripe scad (*ikan selar kuning*), threadfin bream (*ikan kerisi*), croaker fish (*ikan gelama*) and Spanish mackerel (*ikan tenggiri*).

The *Kuih Satar* created the innovation by transforming the *Satar* into the *Popia Satar*. The concept of *satar* was changed based on the cooking method where the original *satar* used grilling methods which consumed a lot of time to confirm it was fully cooked while the *Popia Satar* changed it into frying method. *Popia satar* can also be made frozen and then cooked and served later. The production of *Popia Satar* is a commercial success. Through this innovation, the principle 3 and 4 are developed; (3) modification of the processing steps mostly to ensure a longer shelf life and (4) physical improvements including textural and color properties. Figure 2-76 below shows the difference that have been made for both original *Satar* and *Popia Satar*.

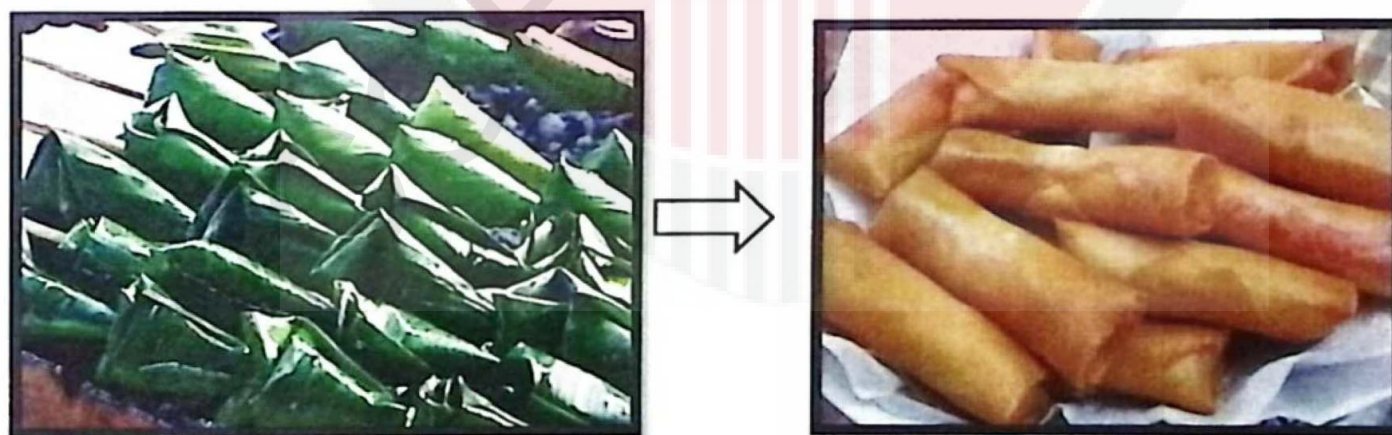


Figure 2-6: The innovations of *satar* to *popia satar*

2.5.5 Dodol

Dodol is a very popular traditional food that has been known since ancient times that is processed traditionally. In Malaysia, *dodol* is one of the special delicacies and is commonly served during festivals; Eid Fitri and Eid Adha. It has a special meaning in the cultural life of Malaysian especially when it is served in special events. *Dodol* is produced in a variety of colours, mostly dark brown, yellow and green. It is made from glutinous rice flour, rice flour, *pandan* leaves, coconut milk, brown sugar and sugar. *Dodol* also is made in various flavours; the famous one is durian flavour. The texture of food is sticky, chewy, soft and thick. The process of making *dodol* is no easy task since it takes a lot of energy to stir the concoction. It is usually cooked in large batches.

The innovation of *dodol* stick has been made to ease people to eat *dodol*. *Dodol* sticks have improved the quality and sale value of products since the packaging is more efficient. It is also more convenient since the stick is quite small and light. In this innovation, there is no changes in formulation of food and processing in food. The innovation is suitable developed by principle 4; (4) physical improvements including textural and color properties. Figure 2-7 below shows the original *dodol* packed in the food container box and the picture on the right side shows *dodol stick* after the innovation.



Figure 2-7: *Dodol*. The innovations of *dodol* to *dodol stick*

2.5.6 Ketupat

Ketupat is one of the common Malay dishes for Eid Fitri and Eid Adha's celebration that shows Malay cultural heritage images. *Ketupat* is important traditional festive food that is normally made one day before the Hari Raya and is eaten with *Rendang* or *Serunding*. There are several types of *Ketupat* depends on culture in each country such as *Ketupat Palas* which is famous in northern Malaysian states of Penang, Kedah, Perlis and Kelantan. *Ketupat Daun Palas* is made of glutinous rice that is compressed and being wrapped with 'palas' leaves in adiamond-shape. The production of this traditional food is a bit tedious and complicated which involve many steps and procedure.

However, *ketupat* tends to have shorter shelf lives since it is made from coconut milk. It is can remain edible for at least two days in cool place. In the market, instant *ketupat* is made in form of ready-to-cook meals. The product is easy to be used; open the packaging and immersed it in the boiling water to simmer for a required time. Instant *ketupat* is readily available in a variety of food products sold in supermarkets. The gravy *rendang* also include in aluminium packed with long shelf lives. Based on the observation, this food can be developed by principle 3; (3) modification of the processing steps mostly to ensure a longer shelf life and. Figure 2-78 shows the difference between *Ketupat Palas* and Instant *Ketupat* in the market.

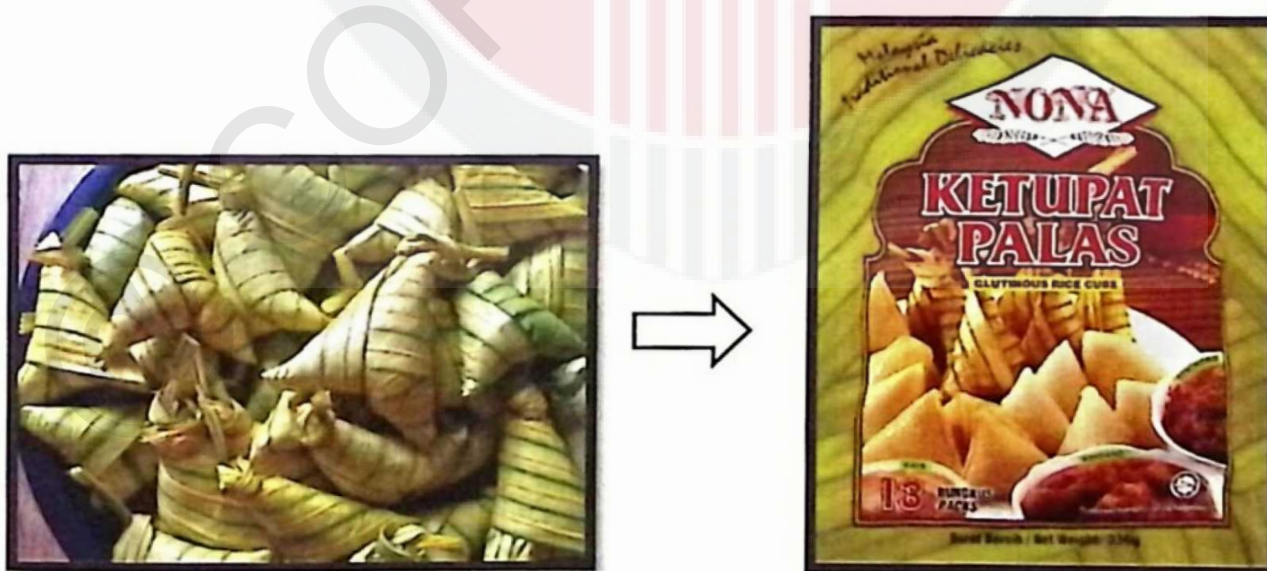


Figure 2-8: *Ketupat palas*. The innovations of *ketupat palas* to instant *ketupat palas*.

2.5.7 Nasi lemak

Nasi Lemak is a traditional Malay dish that has been one of Malaysia's most famous cuisines for centuries. It is typically served for breakfast. Indeed, *Nasi Lemak* is the most popular choice for breakfast but today, it becomes a popular dish that is also eaten throughout the day. The rice is traditionally cooked with coconut milk to make it creamy rice and served with several ingredients which are *sambal* and fried anchovies with peanuts, boiled egg and cucumber slice. It is traditionally usually wrapped in banana leaves and paper. Some small entrepreneurs take an opportunity by selling *nasi lemak* at small stalls. Besides banana leaf, another packaging also being used depends on the seller.

Nasi lemak is a famous traditional cuisine that gives high demand to all Malaysian society. Therefore, an approach has been taken by producing Ready-To-Eat *Nasi Lemak* in the market. The concept of RTE *nasi lemak* comes from principle 3; (3) modification of the processing steps mostly to ensure a longer shelf life. The product is prepared with a heating pack to ease the heating process. Consumers just fill the water inside the packaging with a heating pack and the food is ready to serve. This food is very suitable for students, travellers and people who are constantly busy with work, as this product is extremely easy to prepare in no time and with minimal effort.

Figure 2-9 below shows the differences between the original *nasi lemak* and RTE *nasi lemak* in the packaging.



Figure 2-9: *Nasi Lemak*. The innovations of *nasi lemak* to instant *nasi lemak*

2.5.8 Roti canai

Roti canai is a well-known dish from Malaysian Indian cuisine. In Malaysia, *roti canai* is a snack dish that is typically served with dal or another type of curries such as chicken curry or mutton curry. In certain countries, some recipes also include sweetened condensed milk. It also can be prepared in a variety of toppings and fillings such as eggs, bananas, sardines, and onions. All ethnicities in Malaysia eat *roti canai* as a snack, breakfast, lunch, dinner, and late-night curry accompaniment. It is composed of a variety of ingredients, including flour, water, egg, and fat. The dish is said to have been brought over from India by Indian Muslims and is served in Mamak and other vendor stalls located throughout rural and urban Malaysia.

Nowadays, *roti canai* is not only available in certain food stalls. The entrepreneurs successful to innovate the food into frozen *roti canai* becoming more widely accepted in Malaysia. This is due the foods are extremely convenient to prepare and do not require much time. The intended audience consists of housewives looking to cut costs and save time by purchasing frozen *roti canai*. The processing changes by using freezing method is applies in principle 3; (3) modification of the processing steps mostly to ensure a longer shelf life. Figure 2-910 shows the differences between the original *roti canai* and frozen *roti canai* in the packaging.

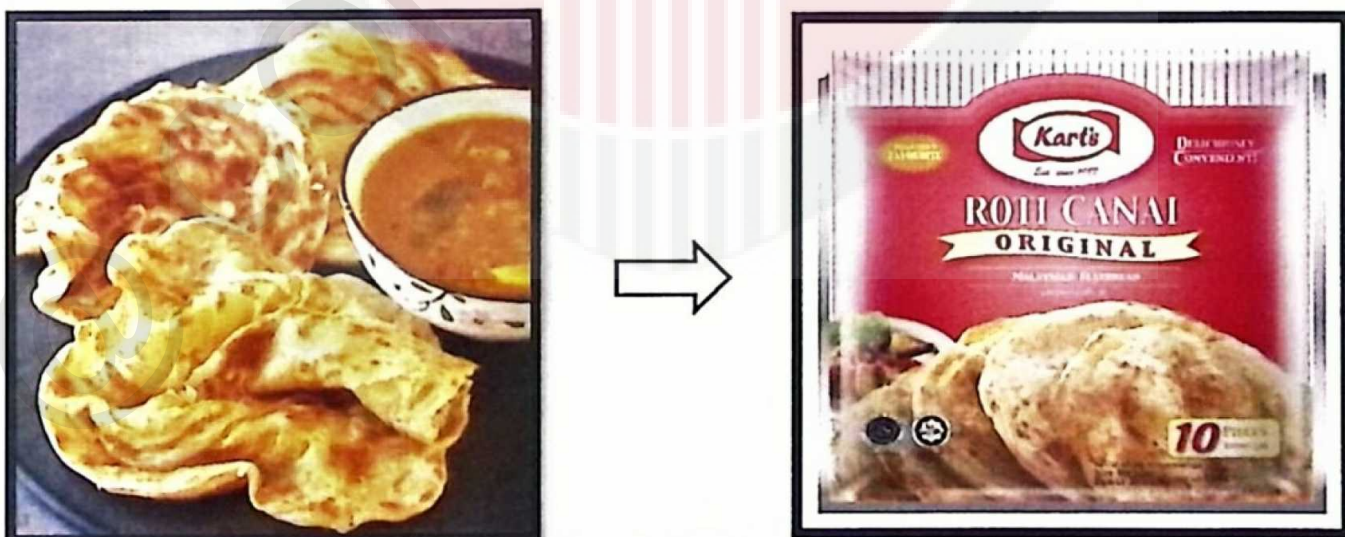


Figure 2-10: *Roti Canai*. The innovations of *roti canai* to frozen *roti canai*

2.5.9 Bahulu

Kuih bahulu is a traditional Malaysian sweet cake that is a favourite among many Malaysia of all races and ages. *Kuih Bahulu* is traditionally baked in brass molds on decorative pattern hot sand surface. It comes in a variety of shapes and the popular one is flower shape. It is a small sponge cake, long-lasting shelf life and very soft. It is usually baked during the special occasions and the festive seasons of Eid Fitri, Eid Adha and Chinese New Year. *Kuih Bahulu* is made from eggs, flour, sugar and leavening agent. The long lasting *bahulu* is because the best storing method. It can be kept unrefrigerated for up to a month.

Following that, the additional flavors were created in *bahulu*, which is *bahulu inti* in a variety of flavors. Nowadays, the original *bahulu* is not the only one that is well-known in the market. The presence of *bahulu inti* in a variety of flavors piques customers' interest. It is made more delectable by the addition of chocolate, strawberry, screwpine, and other toppings. This modern innovated *bahulu* is based on principle 2 in our system which is integration of two product into modern food features. Figure 2-11 the innovation process of *bahulu* that produces *bahulu inti* in the market.

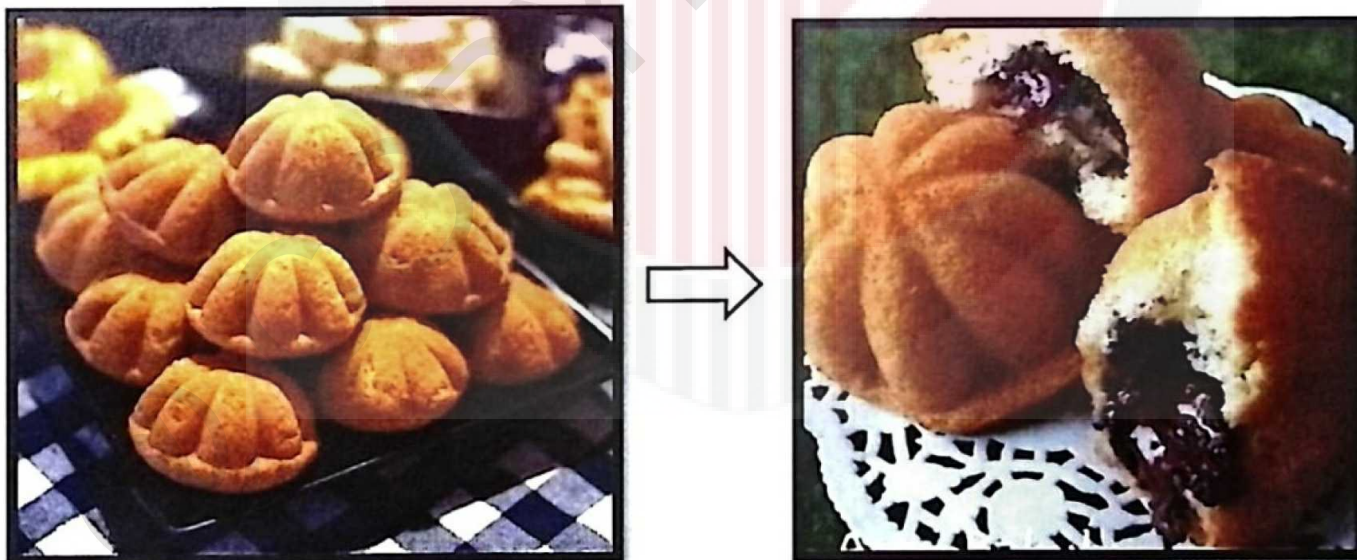


Figure 2-11: *Bahulu*. The innovations of *bahulu* to *bahulu inti*

2.5.10 Pau

Kuih pau is the yeast-leavened filled bun in various Chinese cuisines are known as baozi or bao. Malays have adopted these buns as part of Malay traditional food and known as *Kuih Pau*. *Kuih Pau* is frequently prepared as a breakfast or tea time food. Nowadays, *kuih pau* is consumed at all times and is available at the majority of Malaysian stalls. *Kuih pau* is made from wheat flour that has been fermented before cooked in a steamer over boiling water. The shape is round or cylindrical, white and has smooth skin.

Today, the manufacturing of frozen *kuih pau* is thriving in the food industry. People start to love frozen food it is very easy at all costs. *Pau frozen* gives the same taste as it is made traditionally at home. Townsfolk are now able to enjoy *kuih pau* in the chilled and frozen forms. Freezing method in this process applies to principle 3 which to increase the shelf life of production market. Figure 2-112 shows the original *kuih pau* and frozen *kuih pau* in the market.



Figure 2-12: *Kuih Pau*. The innovations of *kuih pau* to frozen *kuih pau*

Based on the listed innovated Malaysian traditional food, a few innovation approaches have been identified. These approaches will be used as a reference in order for us to develop our own innovative system in this study.

CHAPTER 3

METHODOLOGY

3.1 Outlines of the project

Generally, the project outlines can be divided into two parts which are (Part 1) the development of Strategic Approaches for Innovation of Traditional Food System; and (Part 2) the application of the system on the Malaysian traditional food innovation.

Part 1 include the designing of three stages of the system consisted of (1) pre-assessment stage (2) innovation stage; and (3) post-assessment stage. Meanwhile, the application of system in Part 2 will be performed by (1) the testing the system on selected innovated traditional food available in the market; and (2) the usage of the system to develop a novel innovated traditional food. The outlines of this project is presented in Figure 3-1.

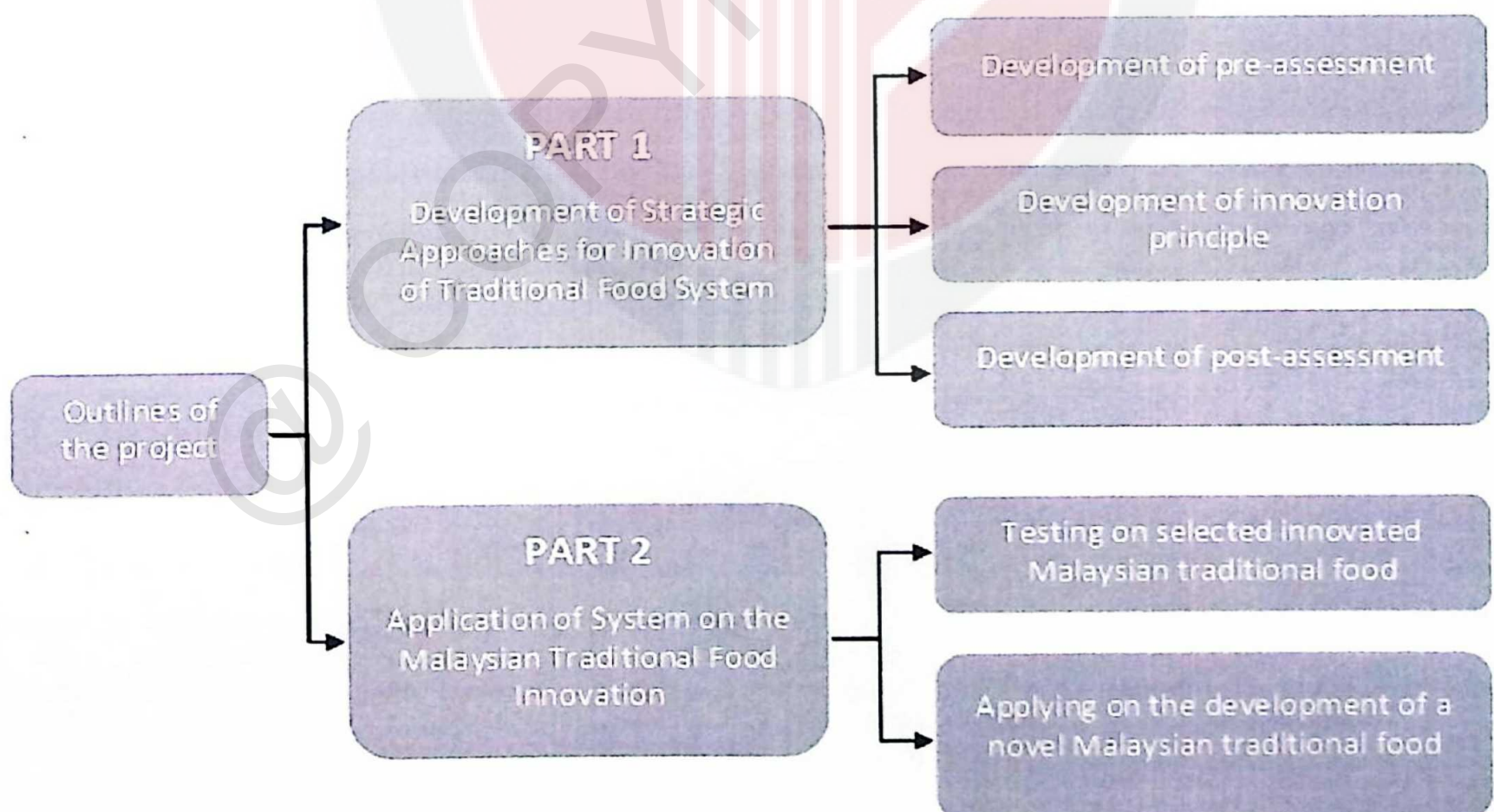


Figure 3-1: Outlines of the Project

3.2 Part 1: Development of the innovation system

To develop complete system, the works have been divided into 3 stages including the development of pre-assessment, innovative principles and post-assessment.

3.2.1 Stage 1 - Development of the pre-assessment of the original products

This stage is developed to evaluate the original traditional food prior to any innovation. The assessment will be based on a few selected criteria that were chosen according to some quality attributes for consumer's acceptance. By referring to these criteria, a set of rubrics will be designed to facilitate the user of system to perform the pre-assessment of the food. The outcomes of the assessment are expected can be used to facilitate the user to do several innovation towards the food as in the stage 2 of system.

3.2.2 Stage 2 - Development of the innovation principles

In this stage, a few innovative principles will be proposed based on the observation of innovated traditional foods available in the market. The proposed innovative principles will be used as a guidance for the system user to get ideas on how to innovate their products. Besides, the proposed principles in this stage can also be used to identify the innovation concept of any selected food in the market. This can be beneficial for the producers as the improvement of the products can be further executed. The proposed innovative principles in this stage will be equipped with a set of rubrics to measure the extent of applications of each principles.

3.2.3 Stage 3 - Development of the post-assessment of the innovated products

After the product has been innovated in Stage 2, the user will have to perform a post-assessment of it. This is to ensure that the innovated product will still have all the quality attributes for consumer's acceptance. This will be done in the Stage 3 of the system. In this stage, the same selected criteria as in the pre-assessment stage will be used to evaluate the quality of the innovated product. Similar set of rubrics will also be referred for the assessment. The outputs of this assessment can be then compare with the pre-assessment of the original product to observe the impact of the innovation.

As overall, the system works in these three stages, namely the pre-assessment, the innovation and the post-assessment as illustrated in Figure 3-2. Any users or producers can follow these stages in order to innovate their own traditional food. Each stage of the system is equipped with a set of rubrics for the reference of the users.

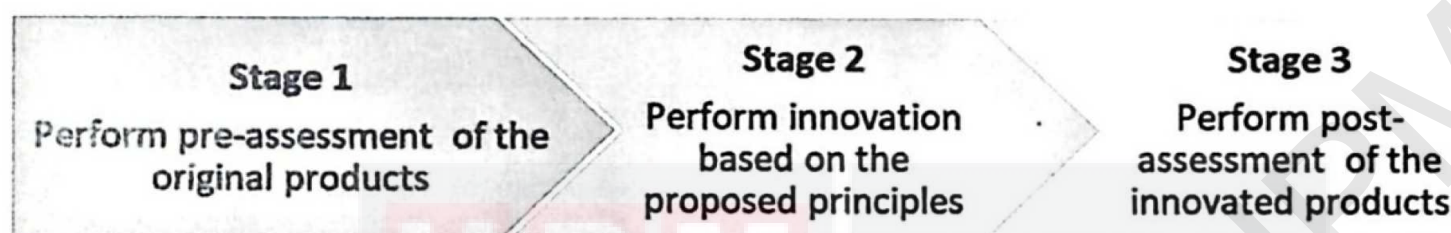


Figure 3-2: Mechanism of the innovation system

3.4 Part 2: Application of system on the innovation of traditional food

In the second part of this project, the developed system will be evaluated by (1) testing the system on selected commercial innovated Malaysian traditional food; and (2) applying the system on the development of a novel innovated food.

3.4.1 Testing the system on selected commercial innovated Malaysian traditional food

Ten selected innovated Malaysian traditional food that are already been commercialised will be selected to test the sensitivity and effectiveness of the system. The pre-and post-assessment of the system will based on the original and its innovated food. While the innovation done on the food will be measured by referring them with the proposed innovative principles in system.

3.4.2 Application of system on the development of a novel innovated food

One Malaysian traditional food will selected and the system will be used in order to innovate the food. All the stages in the system will be followed one by one to observe the effectiveness of the system. The pre-assessment of the original product will be used to determine the potentials of the food to be innovated. The product will then undergone innovation based on the proposed innovative principles of the system. Lastly, the produced innovated product will be asses again to

measure its quality attributes. At the end of this study, a new and novel innovated product is expected to be proposed based on the original Malaysian traditional food.



CHAPTER 4

DEVELOPMENT OF THE SYSTEM

This chapter will be discussing on the development of Strategic Approaches for Innovation of Traditional Food System. In order for system to be established, this study will focusing on the development of all the three stages of the system including the pre-assessment, innovative principles and post-assessment. Matters related to of each stage will be described in details, and a set of rubrics will be designed.

4.1 Stage 1: Pre-assessment of the original products

The aim of this stage is to develop an evaluation system of the original traditional food prior to any innovations. The common recipe of any traditional food will considered as the standard in this study. The assessment will be conducted based on selected criteria in the rubric. These criteria have been selected based on the important attributes of a product for consumers' acceptance. A total of ten criteria have been selected to be included in the assessment as part of the system. The justification on selecting each criterion for the evaluation will be discussed further in this sub-section.

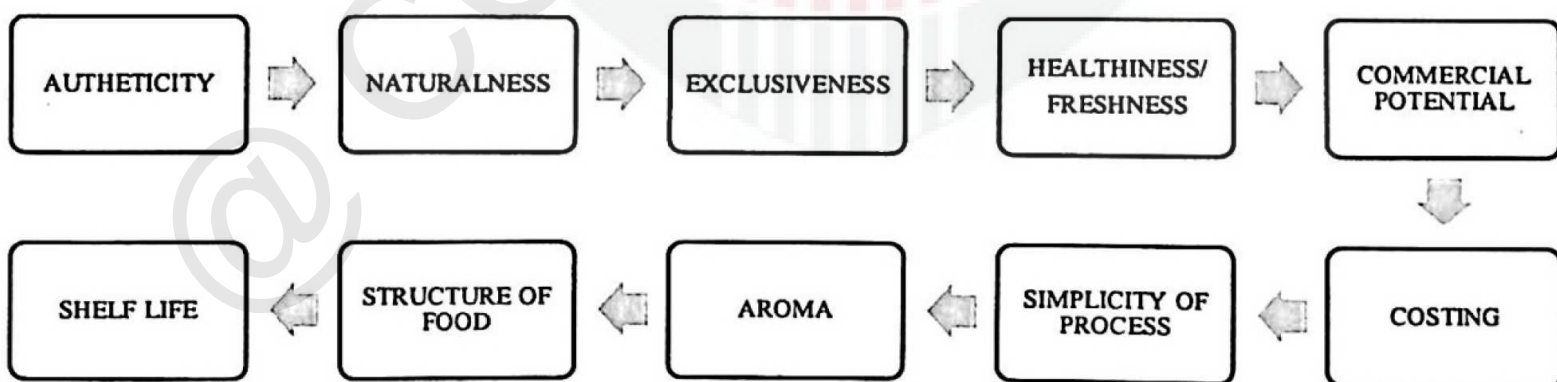


Figure 4-1: Assessment Criteria for Original and Innovated Products

In these criteria, there is no specific percent (%) of changes of the food will be suggested for the replacement/modification of its name. It is up to the producer to decide.

4.1.1 Criterion 1: Authenticity

Heritage food reflects a nation's identity, and Malaysians interested at the authenticity and uniqueness of traditional food. The authentic Malaysian food comes with the speciality and history of the food itself. As an example, the authentic Malaysian satay, a chicken, beef or mutton meat grilled over a flame of charcoal to produce a smoked meat effect. The authenticity of our traditional dishes is the most important to preserve the value of traditional foods.

The authentication of food will be tested in rubric form in the next phase. Food authentication is to test the level of the quality and authenticity of food. The food products are evaluated based on authenticity indicators to detect the originality of traditional food. It will be evaluate to confirm the changes of food authenticity before and after going through the innovation.

4.1.2 Criterion 2: Naturalness

The ancient Malay community frequently used natural ingredients to make our favourite traditional foods such as plants, leaves, vegetable shoots, and so on. The example is in

Figure 4-2, *lemang* and *ketupat* are made from sticky rice and being wrapped with bamboos and *palas* leaves respectively. Sometimes, the uses of banana leaves also needed in the traditional food making before being cooked. From the natural ingredients, it will create the best aroma of food. Besides, mostly the preparation of traditional food is perceived as the natural way. Another example is the making of *Tapai* which is made from cassava or glutinous rice. The method is only wrapping it using leaves and let it fermented for a several days.



Figure 4-2: *Ketupat* and *Lemang*. The naturalness of food will be tested in rubric form to see the natural values in the food. It can be evaluate through the ingredients used in the food include the making process.

4.1.3 Criterion 3: Exclusiveness

The exclusiveness of food before and after innovation will be evaluated. After some process of innovation, the exclusiveness of the food process may change either in small or big changes. Hence, the exclusiveness of food is one criteria that will be include in the evaluation system which have a purpose to measure the exclusiveness of products. They can evaluate the innovative products based on mark scales. Most of customers prefer to have exclusive food depends on their taste. From the rubric scale consumer can evaluate what is the best level to be chose to create new innovated products.

4.1.4 Criterion 4: Healthiness/ Freshness

The modification of food will change the freshness and healthiness to some extent. A research that was conducted by Román et al., 2017 stated that the most desirable food attributes are freshness, naturalness, and minimal processing. They can measure the level of healthiness from the innovative products. For example, the modification of formula in a product by fortification might have the highest mark in healthiness. It will be evaluate based on the content level used in food compared to original food.

4.1.5 Criterion 5: Commercial Potential

Traditional foods in Malaysia does not meet the commercial demand since it have strong competitive with others fast food in the market. Small producer do not stand a chance to promote traditional food products in the market because of the limitations such as short shelf life. This criteria shows how far this product can meet the demand and the marketing level in food industries.

The food can be evaluate to determine how much the commercial values in the products. As stated in problem statement, one of problem in traditional food is it have low commercial values. Before and after innovation process, the food will be evaluate on its commercial value to see the difference. The highest scale number shows the best innovated food that have been commercialized and improved. The selected scale will be chosen depends on complete criteria in commercial food.

4.1.6 Criterion 6: Costing

The products through innovation may have high costs due to the technology used in the production. Mostly, the higher the technology will produce pricy products. It will depend on the production works. Every researcher aims to minimise the operating cost in the meantime to have the best quality of products. In order to achieve their mission, many criteria need to be considered. This criteria is one of the important ones that need to be evaluated in the products so the operating cost of innovation food can be controlled. All the results will be recorded in the assessment rubric in Phase 1.

4.1.7 Criterion 7: Simplicity of the process

This criterion is referring to the cooking method that is used for food preparation. Mostly, traditional food is made by traditional processes like soaking, fermenting, charcoal heat, boiling, and others. These traditional methods play a crucial role in the food making. However, the aim of innovation food is to ease the process making by using modern method or technologies. A better innovation in the food preparation may lead to a simplicity of the process.

The process involve in modification of food will be evaluate based on the process involved during the food making. Some food is adding several process in order to modify the food to follow consumer's desired. It will explain how complicated to produce foods based on the time to produce the products and the number of labor. For each of the products can be evaluated through the evaluation system where the lowest mark represents a simple process and the highest mark represent a complicated process.

4.1.8 Criterion 8: Aroma / Smell

Malay cuisine features unique spices, unique flavors, and unique aromas. There are many aromatic ingredients used in the making of traditional food that makes the food have special aroma. Apart from that, traditional method that is used charcoal fire such bahulu, satay and others will produce a wonderful aroma. Traditional equipment used during the making of traditional food can maintain these foods' aroma and unique taste. Thus, every cooking technique and ingredient used in the food cam uniquely affects their aroma.

The intended users can carry out sensory assessment by fill in the rubric form which involving aroma and smell. It can be tested by detecting the different smell between original traditional food and innovated food. The following qualities are to be given numerical scores between 2 (lowest score) and 10 (highest scores) where nine denotes extremely reasonable and one denotes extremely unacceptable.

4.1.9 Criterion 9: Structure of food

The structure of food includes its size, shape and color. The colour can change slightly different or completely different. The intended users need to fill in the rubric form based on colour, texture and shape. The numerical scores from the lowest score one denote extremely unacceptable and the highest scores indicate extremely reasonable.

4.1.10 Criterion 10: Shelf Life

Traditional food can be categorized as foods that is not last for a long time in room temperature. This is because most traditional food was made from natural ingredients such as coconut milk and did not have any food additives. It can make the food can easily spoil due to microbial contamination in food.

4.1.11 Designed rubrics for the assessment

Based on the selected criteria, a set of rubrics has been developed to pre-assess the original traditional food to be performed. Each rubric has a scale of 1 to 10 to measure the extent of the existence of the selected attributes on the assessed product. The designed rubric is as in Table 4-1.

Table 4-1: Rubric for the pre-assessment of the original product in the system

Criterion	Scale				
	1 - 2	3 - 4	5 - 6	7 - 8	9 - 10
Authenticity	The authenticity of food is extremely unacceptable; modern process	Slightly authenticity; the food is modified with a mixed process (modern and traditional)	The food is moderately authentic; the food is modified modern/ traditionally (shape/colour)	The food is processed modern/traditionally and authenticity of the product is comes from a few regions	The food is made traditionally and highly authenticity owns by its history
Naturalness	The food is not so natural; artificial and synthetic	The food is slightly natural due to few colouring/artificial ingredients added	The food is moderately natural; mixed ingredients used (organic and artificial)	The naturalness of food is accepted; organic ingredients used with complex process	The food is highly natural; made from totally organic ingredients with minimal process
Exclusiveness	The food is not exclusive at all; traditional method and no packaging for the food	The food is slightly exclusive; made with traditional method with classic packaging	The food is moderately exclusive; modern process with unattractive packaging	The food is exclusive; same taste with modern process and normal packaging	The food produced is highly exclusive; delicious taste made from modern processing with creative packaging
Healthiness/ Freshness	The food is not healthy; too much food additive, high unhealthy content, unhealthy cooking method	The innovated food is slightly healthy; medium percent of protein and fat content, less carbo and vitamins	The innovated food is moderately healthy; small portion food additives, enough nutrient	The healthiness of products is enough. Enough carbo, vitamin, and fat.	High healthy content in the food (ex: oat) and healthy cooking method.
Commercial Potential	No potential to be commercialized to worldwide; not interesting, short shelf life	The food is quite nice and need more improvement; less attractive, traditional processing	The food is moderately improving and have potential to small market; preservation method (ex: freezing)	Possible to be commercial to market; new technology, high competition products	High potential to be commercialized to big market; modern technology, attractive, identified need

Operating Cost	The products pricy since it consumes a lot of energy during operation, high technology used	The cost required is quite high but still reasonable; modern processing	The cost is moderately high since it use some energy to produce the food	The product is produced is in low cost and accepted; less payback period	Low cost products used to produce the food and minimal processing
Simplicity of the process	The process involved is so complicated and consume a lot of energy	The is slightly complicated and sometimes it's easy	The food making is at moderate level. It is not too hard not too easy	It required simple process and just nice to produce the food	Minimal process needed to produce the food
Aroma/Smell	The food have no attractive smell; odourless products	The food is less smell ; lack of aroma booster	Smell of the products is just nice; medium smell from ingredients	Smell good and delicious; enough flavours, smell good	Smell so good, interesting, enjoyable and delicious; rich flavours, aroma synchronizes with taste
Structure of food	The colour is dull, texture is too hard/soft, and less tasty	The colour, texture, and taste of food found to be lack of something	The colour different, texture just nice, and taste is good	The colour is attractive, texture is similar, and taste does not change	The quality of colour, texture, and taste meet the expectation and increase one's appetite
Shelf life	The product have shorter shelf life; easily spoil, use-by date (highly perishable food)	The food have shorter shelf life need to be stored in refrigerator	The product have longer shelf life; wet food, store in freezer/chiller (ex: milk)	The food have a long shelf life and suitable to be stored in room temperature and refrigerator	The product have longer shelf life; dry food, best before date (ex: flour, instant noodles)

4.2 Stage 2: Development of the innovation principles and concept

After the original traditional food has been assessed in stage 1, it will then undergone the innovation as to improve its attributes. This will be done on the second stage of the system, in which a few innovation principles will be proposed as a guideline to the producer to innovate their food. The innovative principles listed in this stage are based on observing the common innovation concepts of some innovated food available in the market. Based on the observation, the producer can follow four basic innovative principles to innovate their food. The innovation made might be just following one principle or can be an integration of all. The four innovative principles of the system are being explained further in this sub-topic.

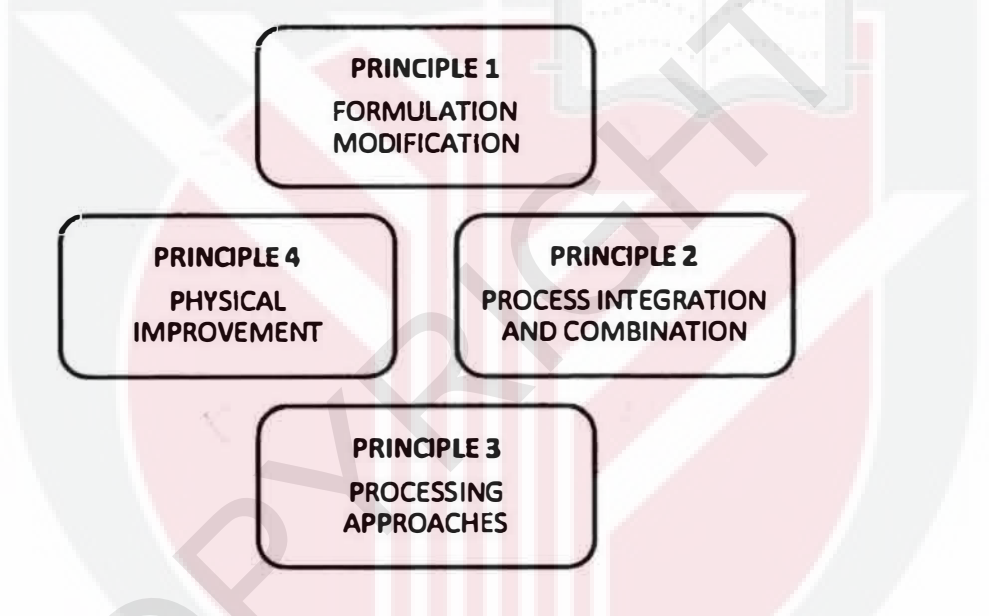


Figure 4-3: Development of Principle Innovation

4.2.1 Principle 1: Formulation modification of products

The innovation based on formulation modification can be made by considering many different aspects such as enrichment and fortification of product, ingredients used in the products, different formula and proportions. The purpose of modification of the formula in the products is to increase the value and quality of products. As explained in the literature review about the fortification, the addition of food fortification into traditional food is acceptable in order to increase the nutritional values of products and increase the health benefits of consumers based on guidelines related to food fortification. Then, the acceptability of products will be tested by an evaluation form provided.

4.2.2 Principle 2: Combination or integration of different products

After the new product innovation is developed, the next step is to ensure the consumer will accept the products. Through these concepts, innovation can be made by referring to the evaluation provided to detect either the products are suitable to be integrated with other products or not. The new approaches of combining different food may increase the products' commercial values and meet consumer's demands. The suitability of each product will be evaluated by a rubric evaluation provided for this concept. The highest mark defines the best products innovation can be made.

4.2.3 Principle 3: Processing approaches

This innovation can be made based on the changes in processing approaches such as by using minimal processing in the food processing or by changing parameters of the products. Other than that, the food's innovation can also be made by adding extra processes such as freezing process or any treatment for the products to increase the quality or shelf life of the products. Then, the products will be evaluated through the rubric marks provided to ensure the successfulness of the processing approaches on the products.

4.2.4 Principle 4: Physical improvement

Through this innovation, the changes that occurred on the products can improve the physical characteristics of the products in terms of colors, texture, shape, packaging, or else. The effect of the innovation of texture can increase the quality of products. As an example of the innovation on physical improvement is the changes in its hardness, springiness, cohesiveness and chewiness can be detected. Then, the testing on acceptance of the innovation will be made through the mark scales.

4.2.5 Designed rubrics for the innovation

Based on the four principles listed in the system, a set of rubrics have been developed in this study to guide any food producer to measure the extent of each principles in their innovation. Each rubric has a scale of 1 to 10 being presented in Table 4-2.

Table 4-2: Rubric for the innovative principles in the system

Criterion	Scale				
	1 - 2	3 - 4	5 - 6	7 - 8	9 - 10
<u>PRINCIPLE 1:</u> Formulation Modification Addition of fortification and enrichment by changing its recipe	The changes of recipe is not necessary; perfect condition	The recipe is slightly change; can be modified but not necessary	The formula is moderately different 50:50	The recipe changes is needed in 70%	Change the formulation at high rate (the whole recipe) Need to improvise more.
<u>PRINCIPLE 2:</u> Process Integration The combination of different products in food	The combination of two product not necessary	The combination of two product is slightly change; can be integrate but not necessary	The combination of two product is in moderately form 50:50	Integrate two suitable different products	Integrate any of suitable product to increase the value; looks appetizing
<u>PRINCIPLE 3:</u> Processing Approaches The technology used in the making of food	No changes needed in product processing	Products processing can be change but not necessary	Products process is moderately change 50:50	The changes in processing is needed at medium rate	Change the overall product processing; high technology needed
<u>PRINCIPLE 4:</u> Physical Characteristics The changes of physical appearance: the texture, shape and colour of food	No changes needed in physical characteristic of products	Slightly changes needed in physical characteristic of products	Moderately changes in physical characteristic of products 50:50	Change the physical characteristic of products in acceptable form	Totally change the physical characteristic of products into different form

4.3 Stage 3: Assessment of the innovated products

The last stage of the system is the assessment of the innovated product. The criteria of the assessment are similar with Stage 1 as to the measure the extent of improvement of the innovated product from its initial form. Hence the same rubric designed in Stage 1 (Table 4-1) can be re-used for this purpose. With the scores obtained in this assessment, the producer can decide whether more innovations are required to improve the food or not. Or else, the innovated food is ready for commercialization

4.4 Overall procedures to use the system

Based on the discussion in this chapter, the three stages of the system have been developed and described. Any user or food producer who want to perform innovation towards their products can follow the system procedures through every stages. The procedures to use the system are illustrated in Figure 4-2.

Each user should start from Stage 1, which is about the pre-assessment of the original products based on some specific criteria. Based on the outcomes, the user may proceed to Stage 2, as the innovation happens by following four main innovative principles. Once the innovation has completed, the user may proceed to Stage 3 where the assessment of the innovated products will be performed based on same criteria in Stage 1. Although this system has guided the user to follow the system stage by stage, there are probability for the user to just use of the stage only depending to their needs and the conditions of the product. For example, if the food product was already innovated, the producer may just jump to Stage 3 to assess their product.

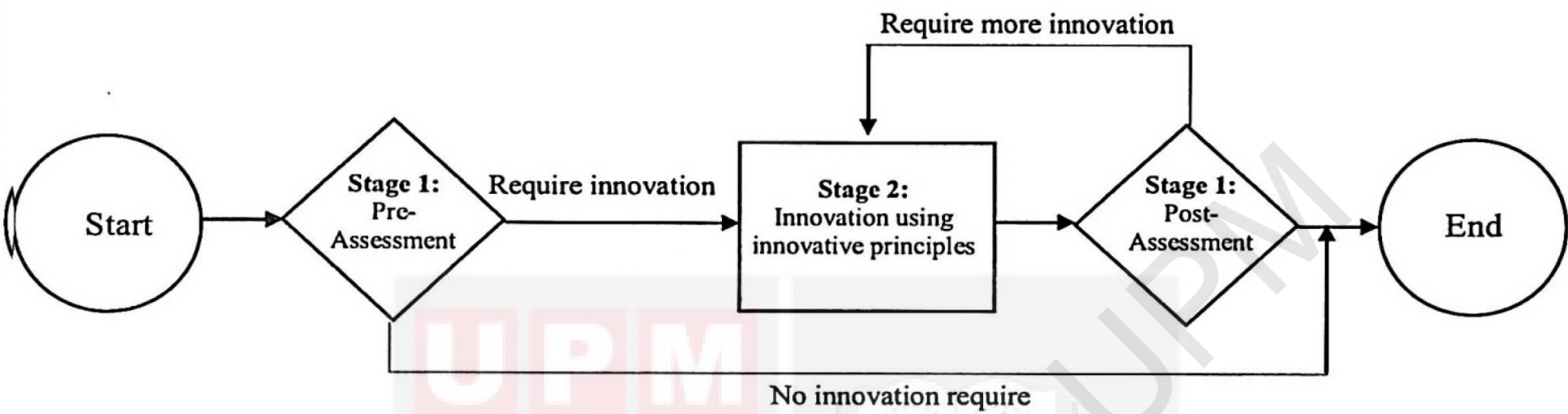


Figure 4-4: Process flow diagram of the system operation

CHAPTER 5

EVALUATION OF THE SYSTEM

The system has been fully developed in the previous chapter. Hence, this chapter will explore the application of the system. The developed system will be tested for verification via two ways (1) by applying the system on selected innovated Malaysian traditional food available in the market; (2) by using the system to develop a novel traditional food product.

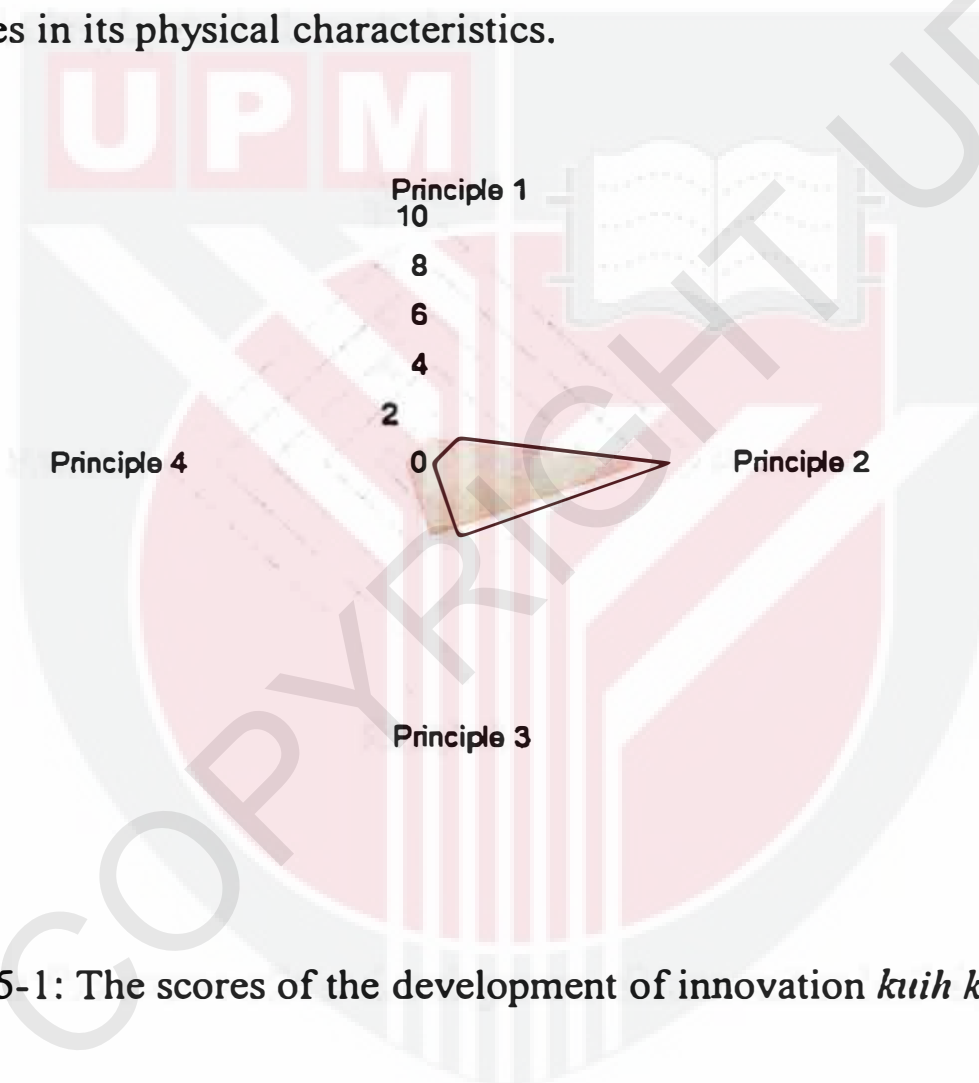
5.1 Verification of the system on selected commercialized innovated products

Based on this study, we have selected 10 innovated traditional food to be evaluated based on our system that we are already developed. The 10 innovated products are;

- 1) Chocolate Kapit
- 2) Lekor Cheese
- 3) Karipap Karbonara
- 4) Popia Satar
- 5) Dodol Durian Flavor
- 6) Ketupat Palas Segera
- 7) RTE Nasi Lemak
- 8) Roti Canai Frozen
- 9) Bahulu Inti
- 10) Kuih Pau Inti Frozen

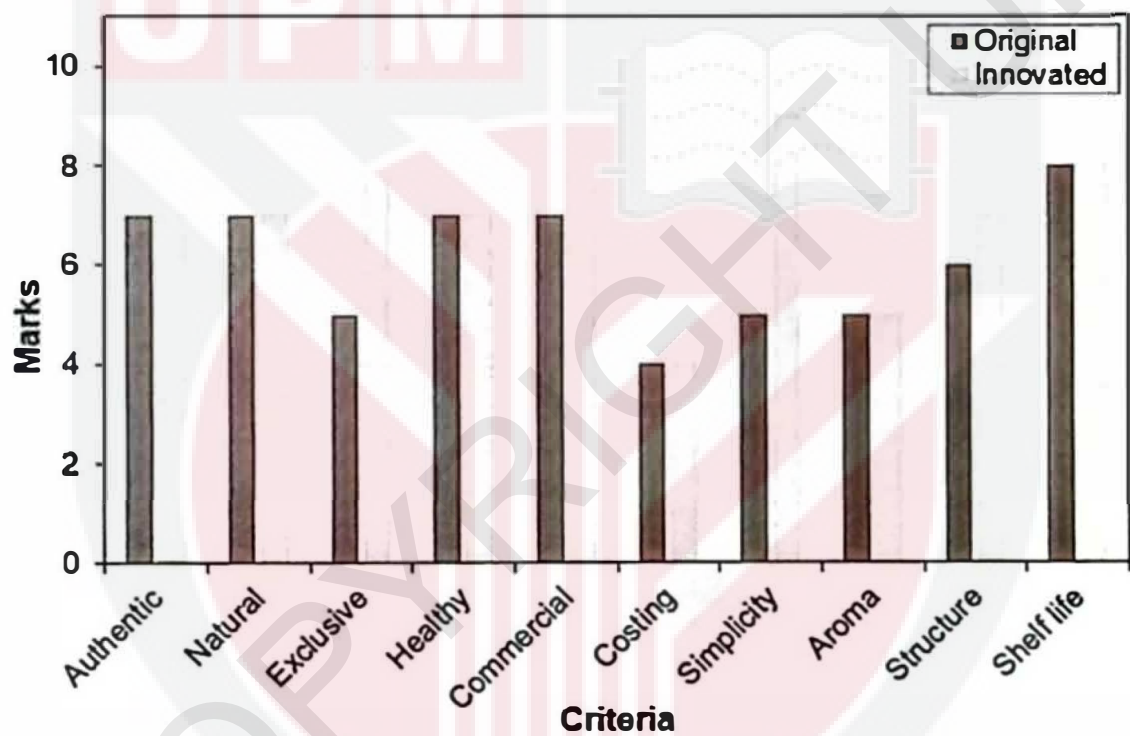
5.1.1 Evaluation 1: Kuih Kapit

The Graph 5-1 below shows the development of innovation made by *kuih kapit* in percentage. The innovation of chocolate and peanut *kapit* shows the highest percentage of the process integration, referring to principle 2 in the system. It shows that the original *kuih kapit* combines or integrates with chocolate and peanut to produce successful chocolate and peanut *kapit* in the market. However, the result in principle 1 and 4 shows lower marks since there are no changes in the formula and no changes in its physical characteristics.



Graph 5-1: The scores of the development of innovation *kuih kapit*

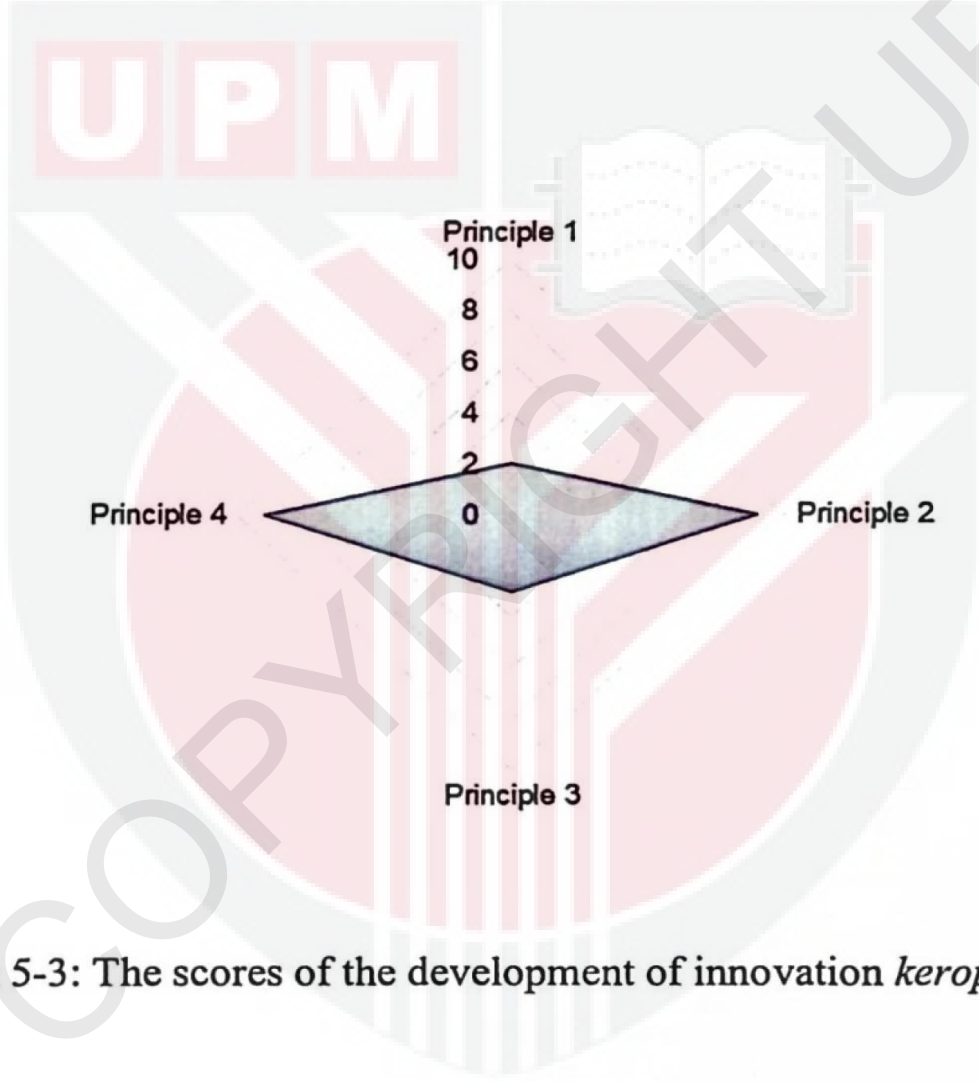
The Graph 5-2 below shows the comparison of pre and post assessment of original *kuih kapit* and after innovation. The graph shows that the exclusiveness shows the highest marks for the innovative *kuih kapit* compared to the original food. The addition of chocolate as a filling in the food increases the value of the food. The innovation of *kuih kapit* also gives the highest marks on simplicity of the process since the process was made by using a modern electric toaster for *kuih kapit*. This will make the preparation less time consuming compared to traditional methods.



Graph 5-2: Pre and Post Assessment on the traditional and innovated *Kuih Kapit*

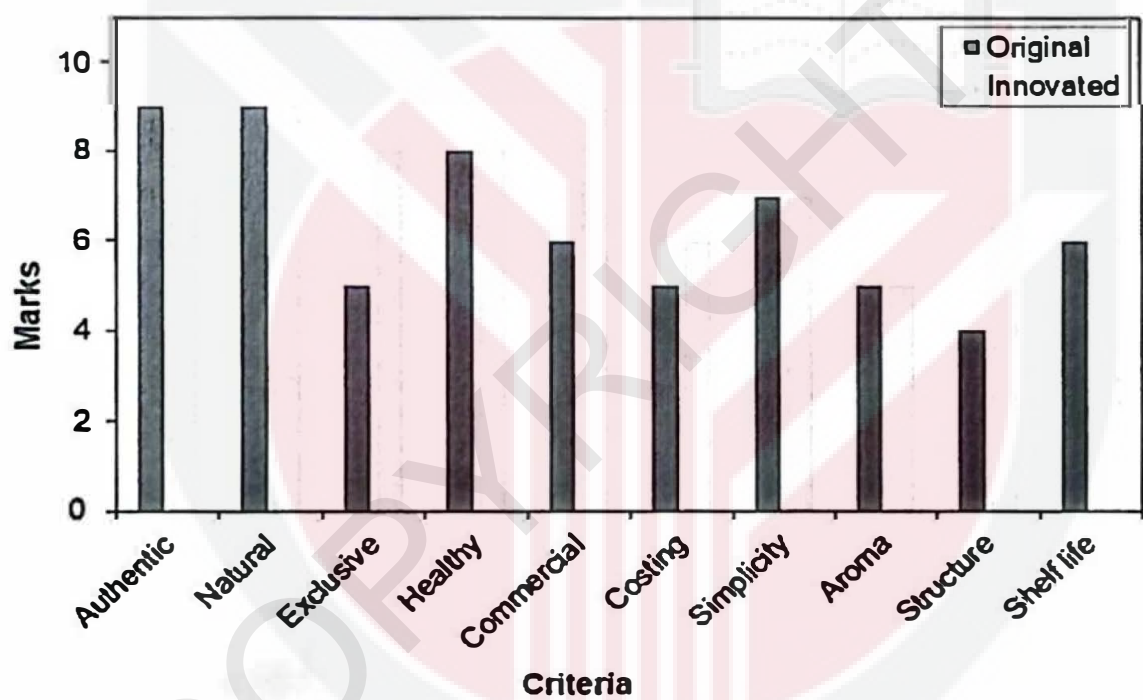
5.1.2 Evaluation 2: Lekor Cheese

From Graph 5-3 below, the result of the development of innovation shows the highest percentage on principle 2. *Keropok lekor* was integrated with cheese and produces lekor cheese which has high demand in the market nowadays. Principle 4 also shows a high percentage since the shape of the product is changed to small lekor cheese balls. However, the result in principle 1 and 3 shows lower marks since there are no changes in formula and small changes in processing approaches.



Graph 5-3: The scores of the development of innovation *keropok lekor*

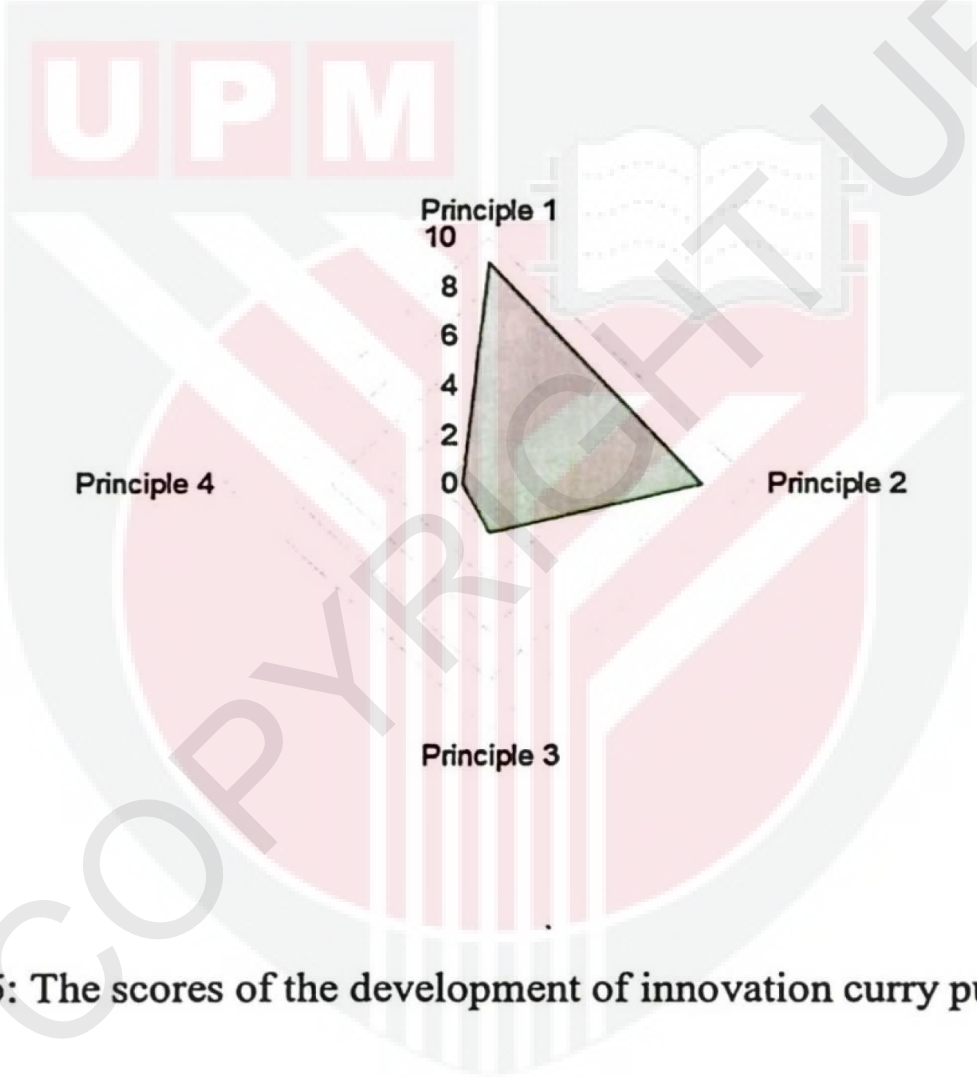
As shown in the Graph 5-4 below, *lekor* cheese balls give the highest mark on the exclusiveness compared to the original *keropok lekor*. The innovation occurred when the cheese was induced inside the *keropok lekor* and the changes of its shape from long shape to ball-like makes the food more exclusive. The idea for producing this product has captured the fans of this food. It also gives high marks on the commercial potential since this *lekor* cheese ball can be frozen and have a long shelf life. From this process, the costing increases a bit since there is an addition of cheese in the products.



Graph 5-4: Pre and post assessment on the traditional and innovated *keropok lekor*

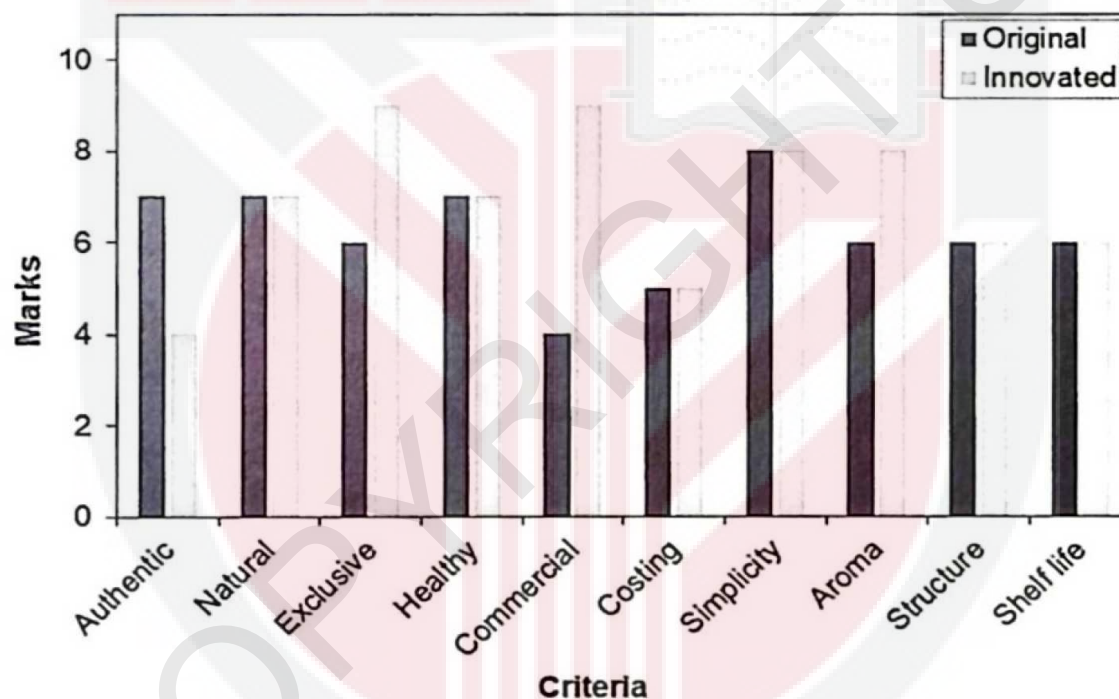
5.1.3 Evaluation 3: Karipap Karbonara

Graph 5-5 below shows the innovation of curry puff that is obviously using principle 1 since the formula of curry potato filling has changed into carbonara filling. This makes the percentage on principle 1 get the highest values than others. The percent of principle 2 also shows high marks and there is no change in principle 3 and 4 since the method of cooking the *karipap* carbonara is the same as before and the shape, structure and appearance also remains the same.



Graph 5-5: The scores of the development of innovation curry puff

From the Graph 5-6, we can see that the authenticity graph for the innovative food which is *karipap* carbonara is lower than the original curry puff. This could be explained by the presence of carbonara filling (western dishes) inside the curry puff that makes the curry puff lose its authenticity. However, the innovation of *karipap* carbonara shows the highest marks in exclusiveness after the innovation had been done. Then, the commercial potential and aroma of *karipap* carbonara also has increased compared to the original curry puff while the physical appearance of the curry puff remains the same.

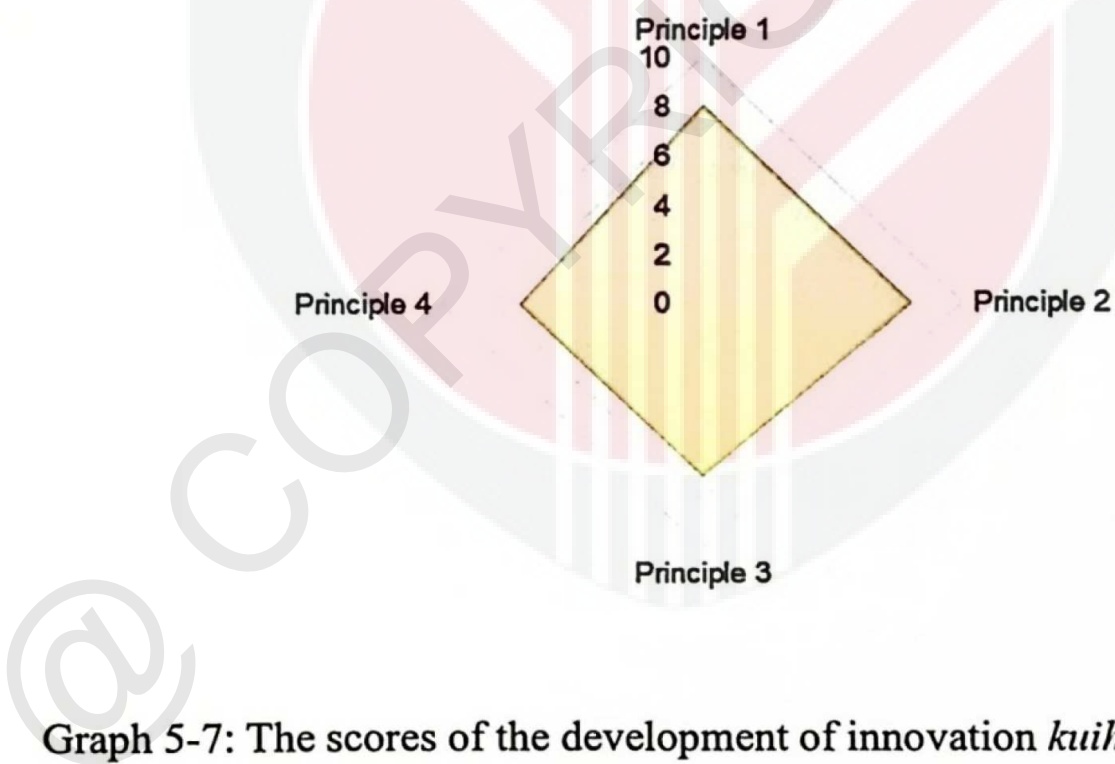


Graph 5-6: Pre and Post Assessment on the traditional and innovated curry puff

5.1.4 Evaluation 4: Popia Satar

Graph 5-7 shows the percentage of innovation of principle and concept of traditional food. From the innovation, the highest percentage goes to principle 3 and 4. In principle 3 (processing approaches the food), the *popia sata* had changed the preparation and cooking method from using the charcoal heat to frying in the pan. The cooking method affects many things in *kuih sata* such as the aroma of the food. The original *kuih sata* used to have a smoky smell and aromatic *sata*. The principle 4 explained the physical characteristics of *popia sata* where the shape of the food had changed from the pyramid-like into popia-like form (long cylinder shape).

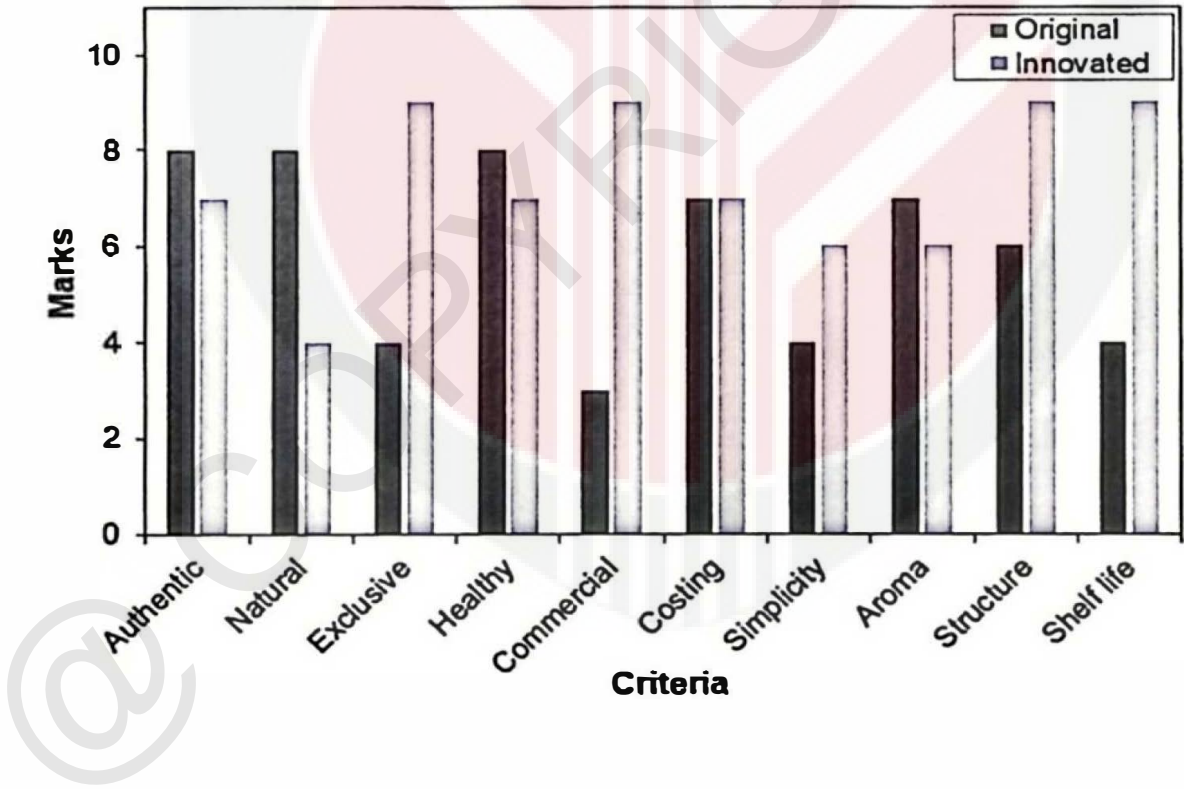
Principle 1 gets low marks since there is not too much formula changed in *popia sata*. Even though the cooking method and the shape has changed, the formula of *sata* which is made from boneless fish remains the same. Lastly, there is no process integration between two foods.



Graph 5-7: The scores of the development of innovation *kuih sata*

Graph 5-8 below shows the result of all criterias after going through innovation from *kuih sata* to *popia sata*. The exclusiveness of the *popia sata* got the highest marks after the innovation. Same goes to the commercial potential value is at high marks since the innovation makes the *popia sata* can be commercialized in the market. It also form as a frozen *popia sata* and increase the shelf life of the food.

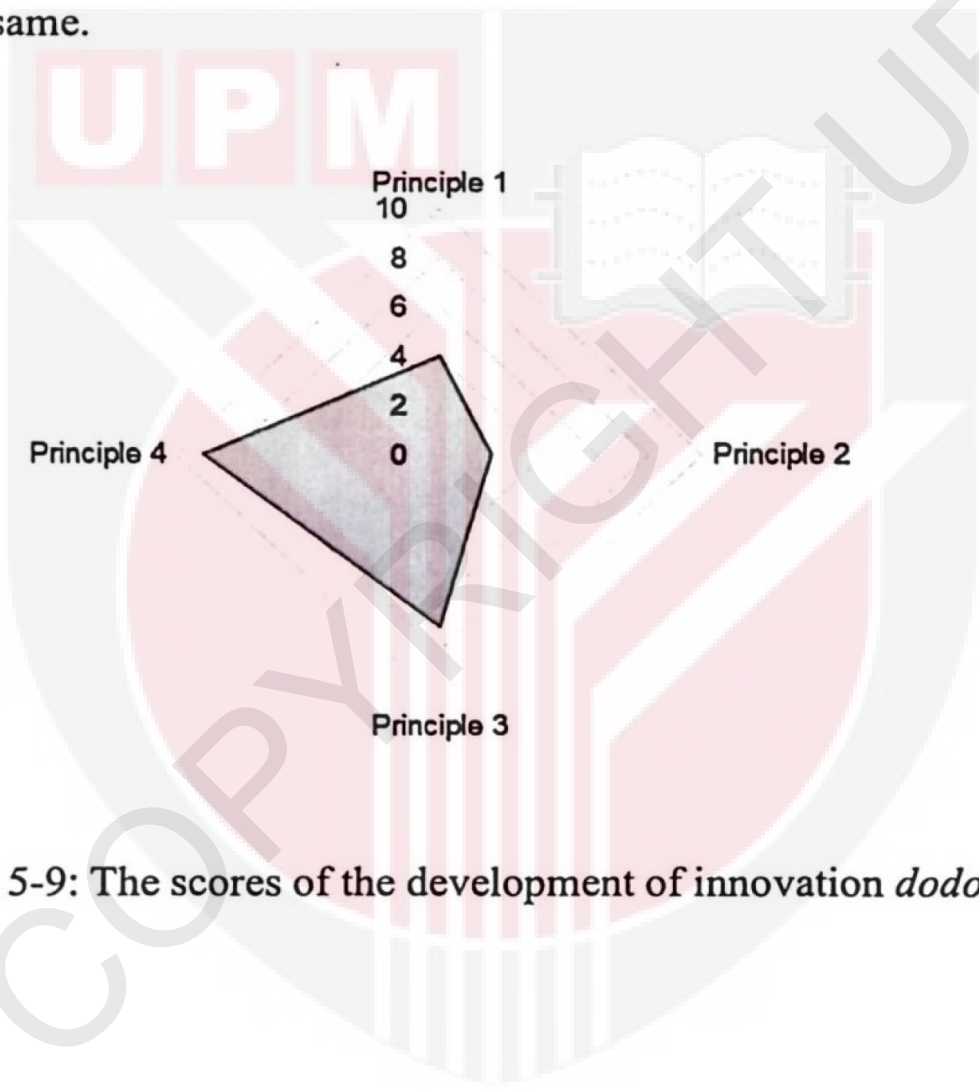
As we can see, the marks for authenticity, naturalness and healthiness of the product are dropping since there are changes in cooking methods. The authenticity of *sata* graph is only a drop in small marks since the innovation of *popia sata* still remains the same ingredient and taste of *sata*. However, the original *sata* which was originally wrapped by banana leaves has changed to *popia sata* which makes it lose the naturalness and also its smoky smell.



Graph 5-8: Pre and Post Assessment on the traditional and innovated *kuih sata*

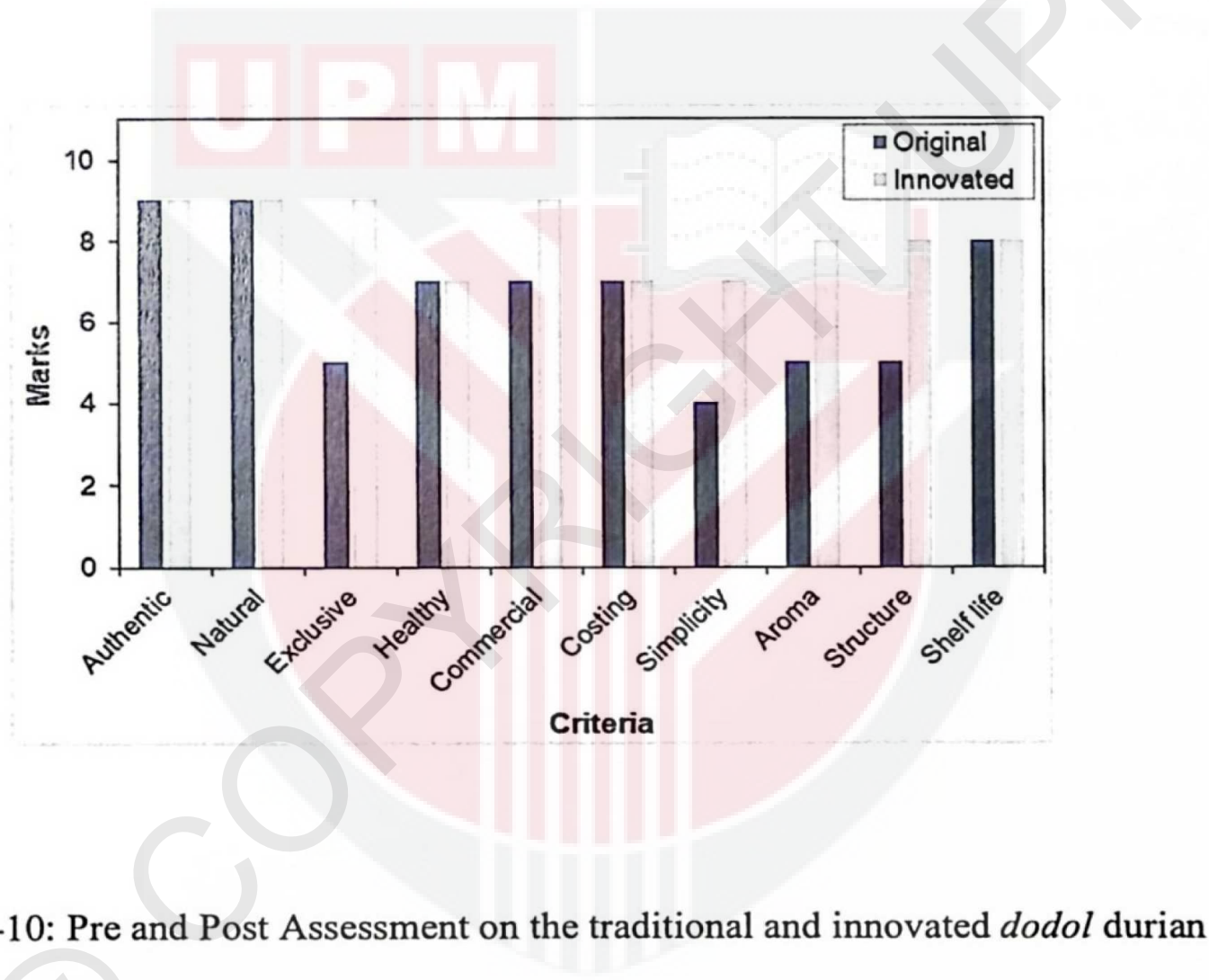
5.1.5 Evaluation 5: Dodol Stick (concoction)

From the Graph 5-9 below, principle 4 (physical characteristics) got the highest percentage since there are changes in shape into stick form. In this innovation, the other principle is not involved since there are no changes in cooking methods and formula modification. Principle 2 may get some points if there is the integration of other flavours in the *dodol* stick such as the most popular one which is durian flavour. It can be *dodol* durian stick in the market. In principle 3, the processing approaches remain the same.



Graph 5-9: The scores of the development of innovation *dodol*

Graph 5-10 below shows the highest marks on the exclusiveness of the products since *dodol* stick is more convenient and easy to ring to anywhere. The value of commercial potential also is at high marks. The structure for *dodol* stick has changed into a stick shape. *Dodol* also has several flavors that make the aroma got high marks. The shape of *dodol* stick is made to ease the consumers to eat the *dodol*. All other criteria remain the same since no other formula changes occurred in the innovation.

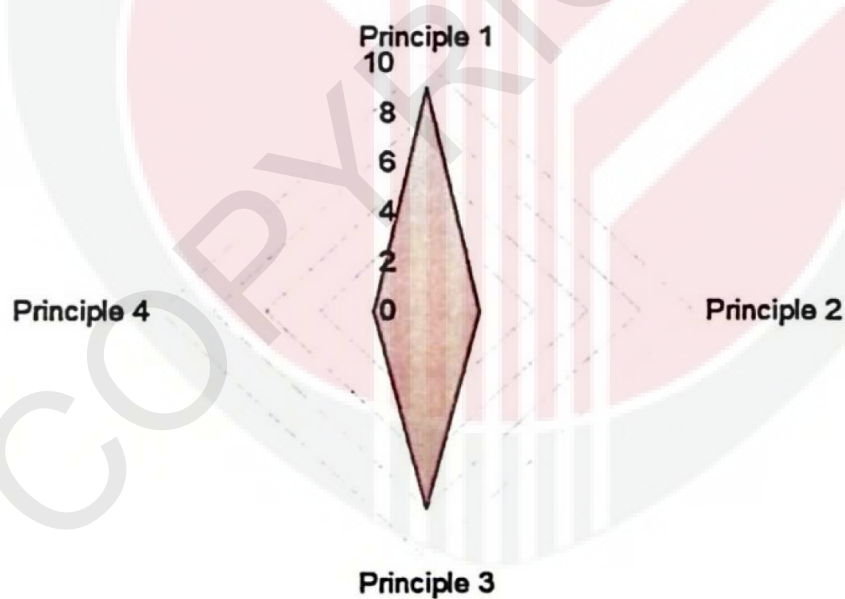


Graph 5-10: Pre and Post Assessment on the traditional and innovated *dodol* durian

5.1.6 Evaluation 6: Instant Ketupat

Graph 5-11 shows the scores of instant *ketupat* in innovation development. Instant *ketupat palas* have the highest percentage on principles 1 and 3. In principle 3 (processing approaches the food), the instant *ketupat palas* had changed the preparation and cooking method from the traditional method to just boiling for several minutes. The cooking method affects many things in *ketupat palas* such as the aroma of the food. Principle 1 explained the formula modification that is occurred in the instant *ketupat*. The ratio of the original formula may be different than the innovative food.

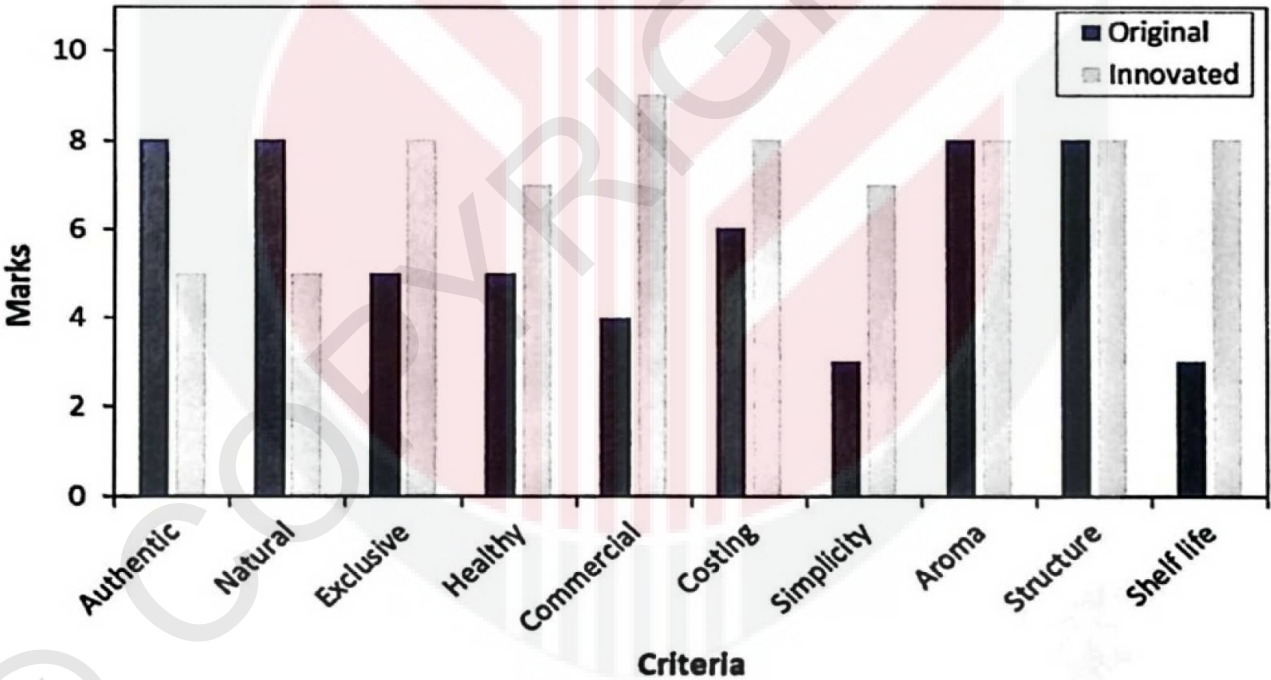
Principle 2 (process integration) gets low marks since there is no combination of any food inside the *ketupat*. Then the principle 4 also gets low marks since the shape innovated with the same as before. Instant *ketupat palas* being famous to all people who are busy with working life.



Graph 5-11: The scores of the development of innovation *ketupat palas*

Graph 5-12 below shows the highest marks value in exclusiveness and commercial potential of instant *ketupat palas*. As we can see, nowadays, many big brand company created instant *ketupat* to ease all the consumers during the special day Hari Raya. It is proved that this innovation can be commercialized worldwide. Other than that, the shelf life of the food also increases since it can last long before the boiling process. This instant *ketupat* has higher costing than the original *ketupat* since it has to go through a high technology process during the process making.

However, there are several marks that is dropping due to processing method changing which are their authenticity and naturalness. The naturalness of *ketupat* that is being wrapped in *daun palas* is changing to plastic packaging.

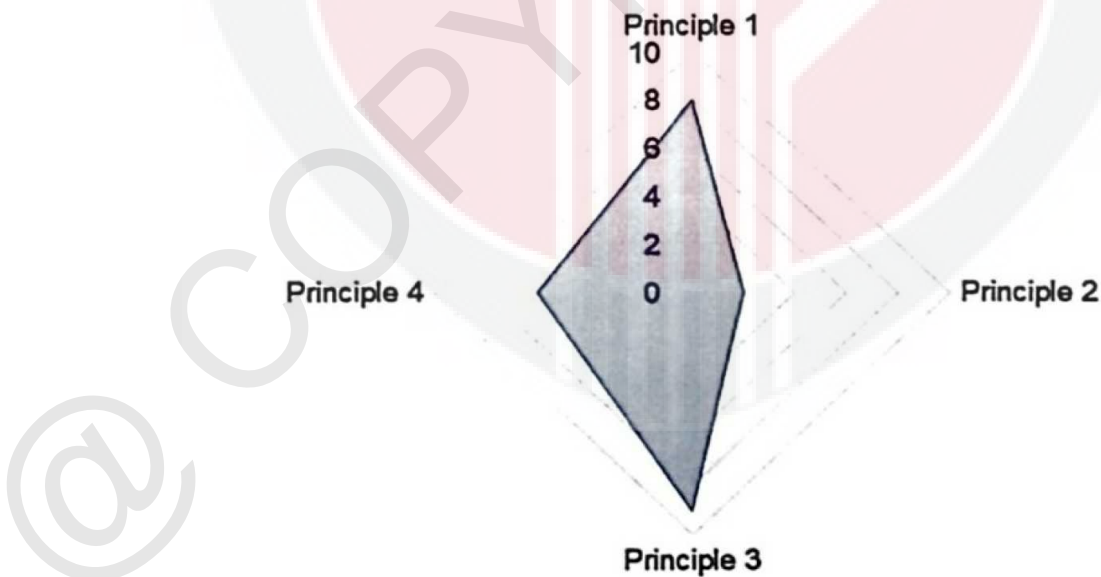


Graph 5-12: Pre and Post Assessment on the traditional and innovated *ketupat palas*

5.1.7 Evaluation 7: RTE Nasi Lemak

Based on the spider web Graph 5-13 below, we can see that the percentage of principle 1 and principle 3 at the highest marks. Principle 1 explained the formula of *nasi lemak* that has been modified to produce RTE *nasi lemak*. It is a fact that the original *nasi lemak* is produced by coconut milk which is can easily be spoiled. The formula is modified to consider the shelf life of products. In principle 3, the processing approaches percentage is increase since the production of RTE *nasi lemak* is using modern technology. The heat warmer is also provided in the *nasi lemak* packaging to be heated by any liquid. It is very suitable to be used by travellers and hikers.

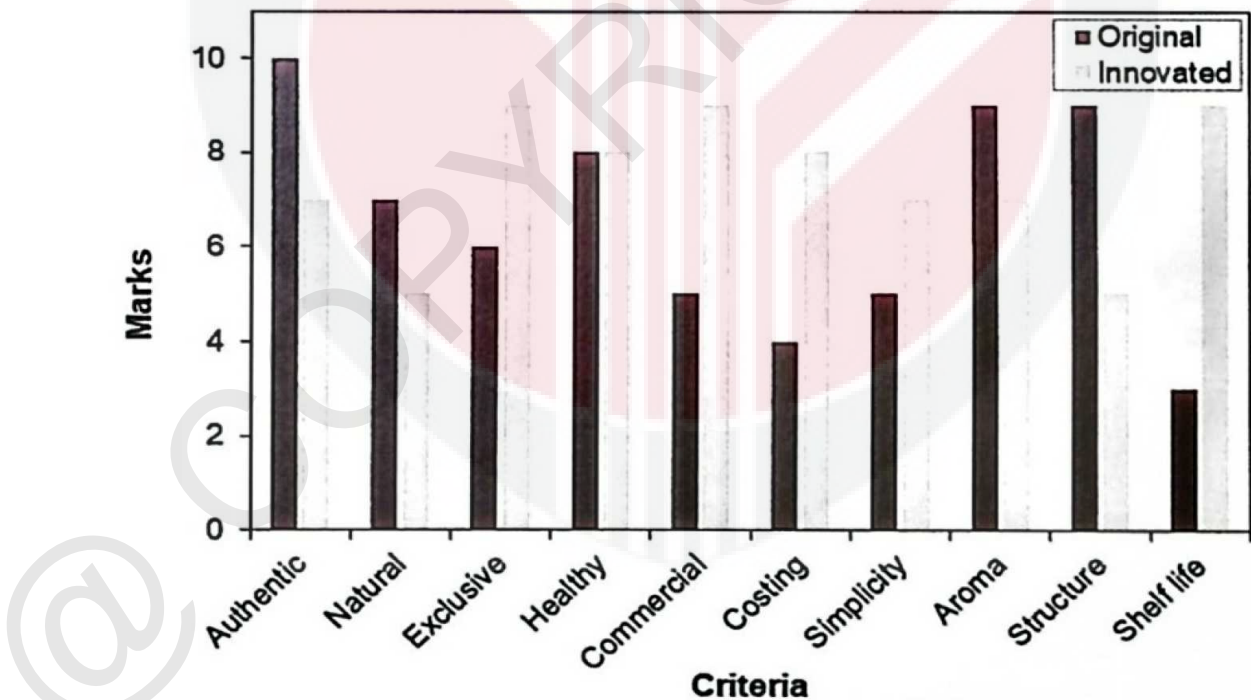
While the principle 4 is at the middle which explained physical characteristic of *nasi lemak* is being innovated. Lastly, the principle 2 shows the lowest percentage over all the others. This is because there is no combination of other food inside the *nasi lemak*.



Graph 5-13: The scores of the development of innovation *Nasi Lemak*

Graph 5-14 below shows the result of assessment in graph form. As mentioned in the introduction, *nasi lemak* is the number one food trend in Malaysia. Based on the facts, it has high demand in the market. Some entrepreneurs take this opportunity to produce instant *nasi lemak* in form of Ready-To-Eat Nasi Lemak. The production is suitable for travellers, students and hikers. The exclusiveness marks had increased to the highest marks. The same goes for commercial potential marks which give high values than the original *nasi lemak*. The production of RTE *nasi lemak* is famous all around the world.

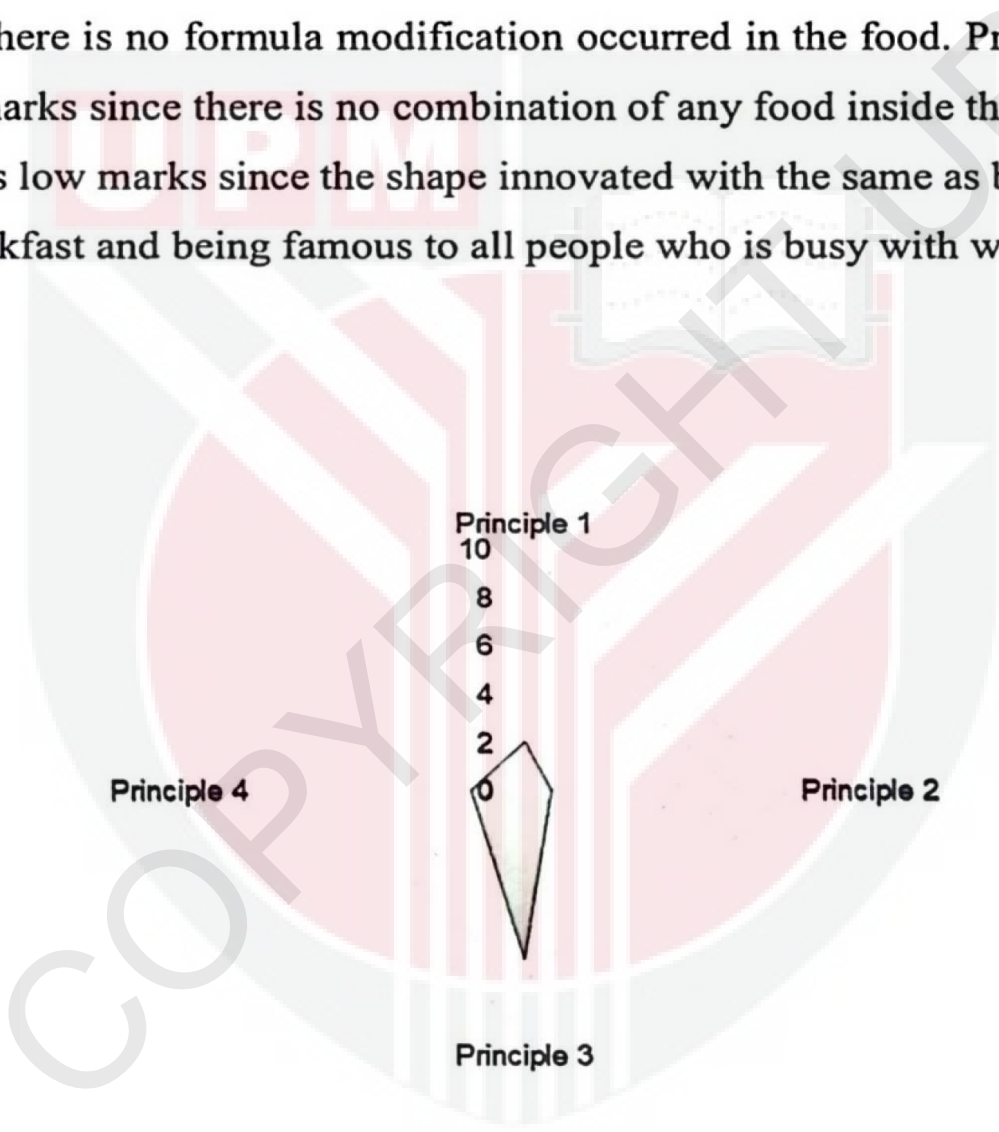
However, through several processes, the authenticity of RTE *Nasi Lemak* is decreased a bit than the original *nasi lemak*. The naturalness of *nasi lemak* also decreases since the use of banana leaves wrapping is replaced with the plastic packaging. From the pyramid-like shape, the RTE has changed the structure from the shape of the packaging.



Graph 5-14: Pre and Post Assessment on the traditional and innovated *Nasi Lemak*

5.1.8 Evaluation 8: *Roti Canai* Frozen

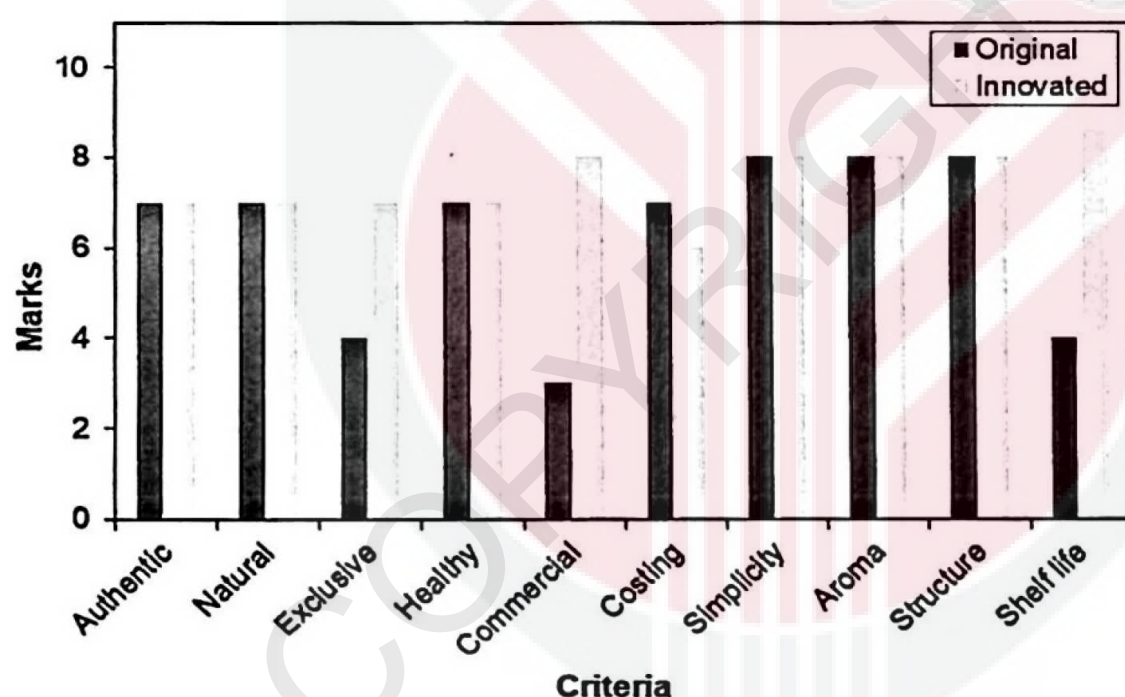
Based on the Graph 5-15 evaluation, frozen *roti canai* has the highest percentage on principle 3. In principle 3 (processing approaches the food), the frozen *roti canai* had changed the process at the end of the process which is to be frozen while preparation until the cooking method is just the same. The cooking method used is only par-fried before going through the packaging process. Principle 1 explained there is no formula modification occurred in the food. Principle 2 (process integration) gets low marks since there is no combination of any food inside the *roti canai*. Then the principle 4 also gets low marks since the shape innovated with the same as before. Instant *roti canai* is eaten as a breakfast and being famous to all people who is busy with working life.



Graph 5-15: The scores of the development of innovation *Roti Canai*

Based on Graph 5-16 below, the innovation of *roti canai* only changes in several criteria such as the exclusiveness, commercial potential and shelf life of the products. The start from the cooking method until the packaging is using the same method as the original *roti canai*. Through the observation, the authenticity, naturalness and healthiness/freshness are remain the same. There is also no change in the structure of the food.

We can see that the innovation of *roti canai* shows the highest marks in exclusiveness after the innovation had been done. Then, the commercial potential and shelf life of *frozen roti canai* also have increased compared to the original *roti canai*.

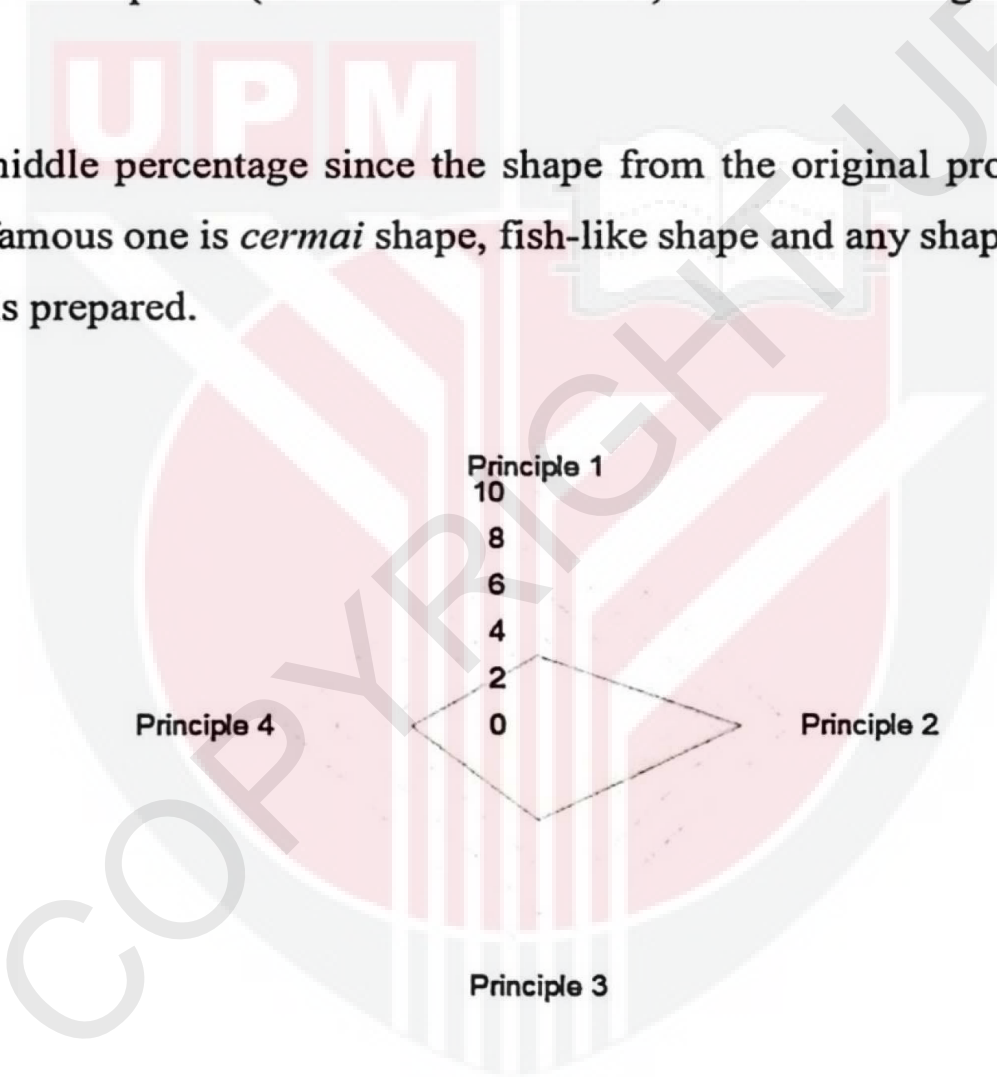


Graph 5-16: Pre and Post Assessment on the traditional and innovated *Roti Canai*

5.1.9 Evaluation 9: Bahulu Inti

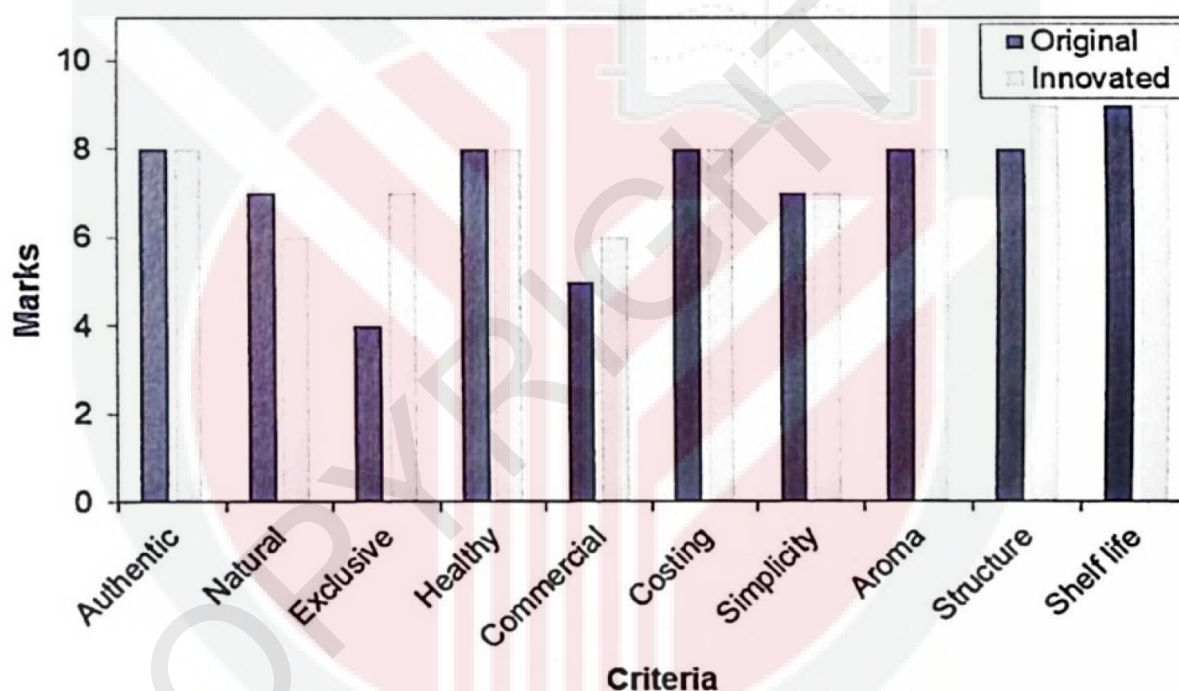
From the Graph 5-17 below, the result of the development of innovation shows the highest percentage on principle 2 which is the process integration and combination. Original *bahulu* was integrated with chocolate and *pandan* and produces delicious *bahulu inti* which increases the demand in the market. The process approaches are changes a bit since there is an induction of other flavors inside *bahulu*. Principle 1 (formula modification) does not change in the innovation process.

Principle 4 is at the middle percentage since the shape from the original products already in a variety of shape. The famous one is *cermai* shape, fish-like shape and any shape can be created as long the *bahulu* mold is prepared.



Graph 5-17: The scores of the development of innovation *Bahulu*

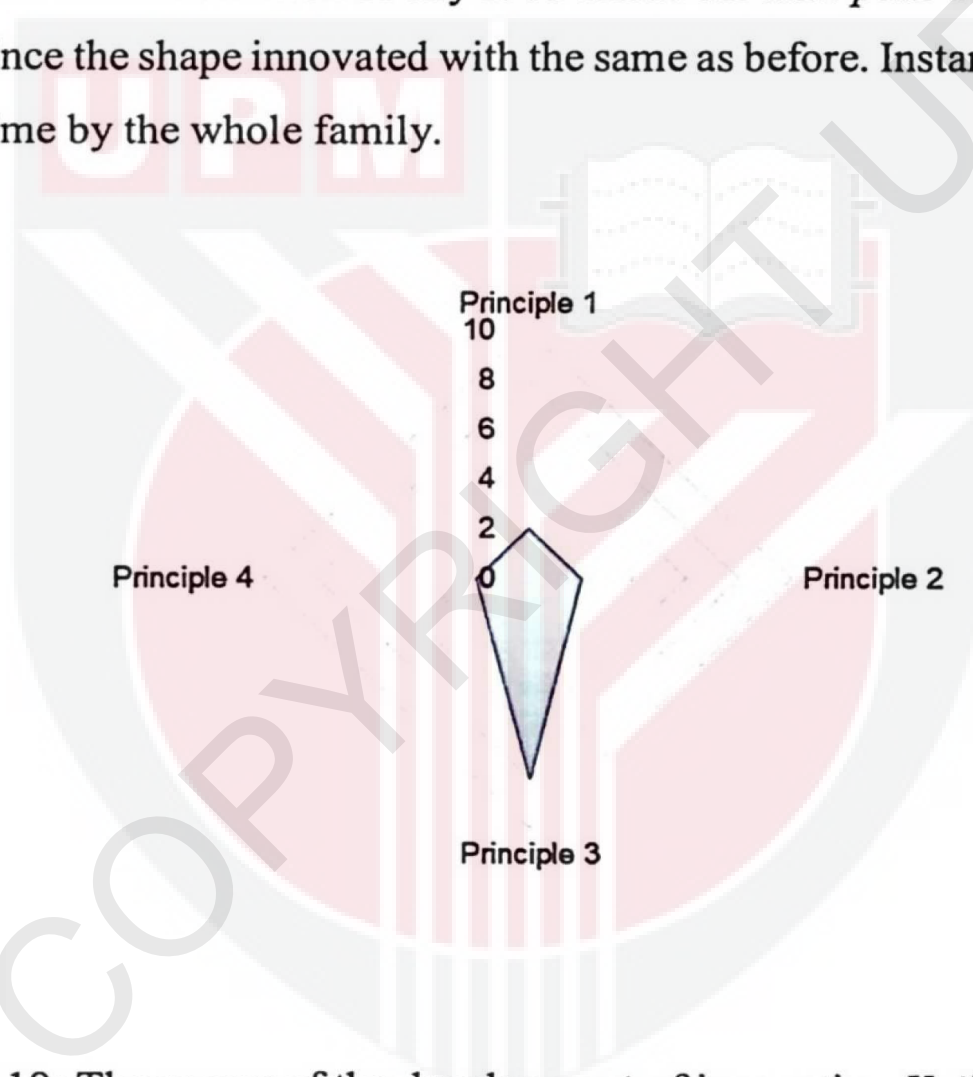
As shown in the Graph 5-18 below, innovated *bahulu* which is *bahulu inti* give the highest mark on the exclusiveness compared to the original *bahulu*. The combination of popular flavour inside the *bahulu* such as chocolate, *pandan* and others makes the food more exclusive. The production of chocolate *bahulu* has increased teenagers and kids nowadays who do not care about traditional food. It also gives high marks on the commercial potential since this *bahulu inti* increases the demand in the market. From this process, the cost increases a bit since there is an addition of other flavors in the products. Lastly, the naturalness of the product has decreased a bit.



Graph 5-18: Pre and Post Assessment on the traditional and innovated *Bahulu*

5.1.10 Evaluation 10: *Kuih Pau Inti Frozen*

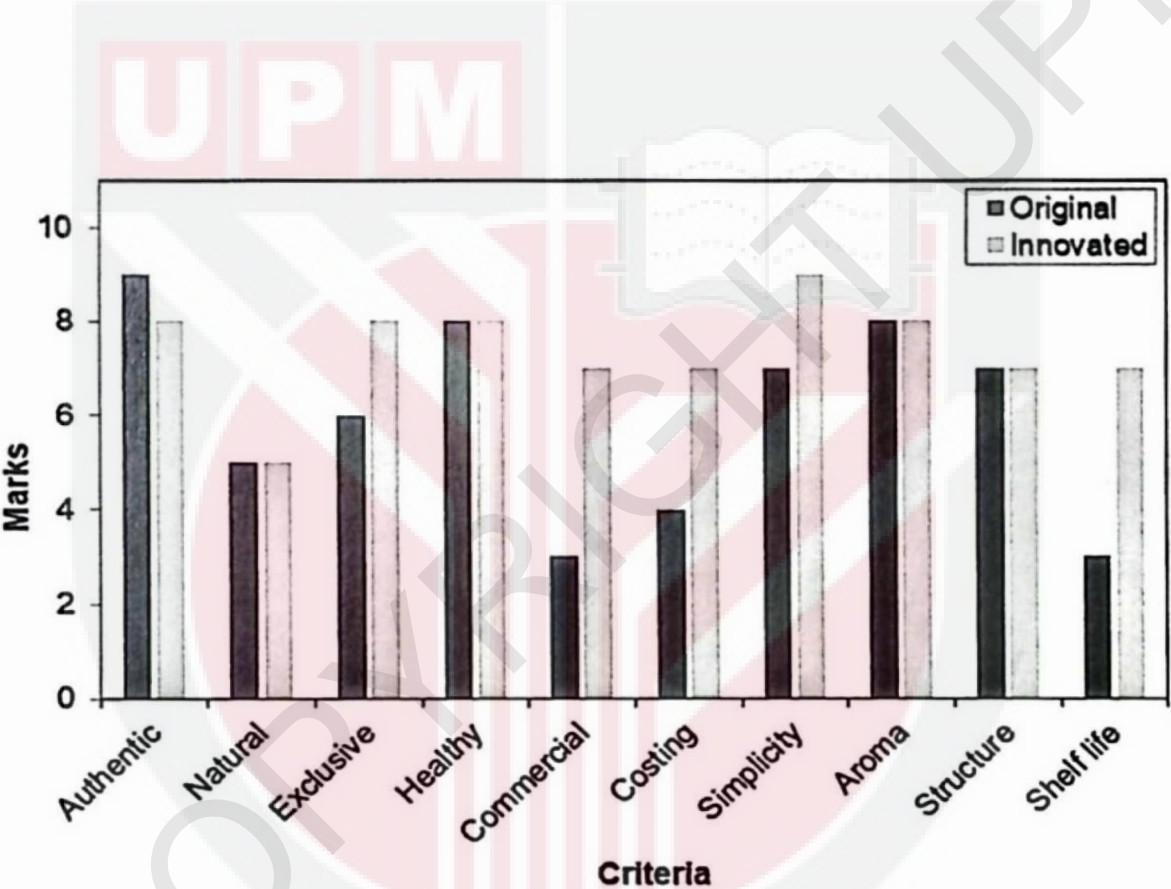
In Graph 5-19 evaluation of innovation food goes to *kuih pau*. This innovation strategy approach is similar as frozen *roti canai* since it is using the same method to preserve the food which is the freezing method. The graph below shows the highest percentage on principle 3. In principle 3, the processing approaches the food, the frozen *kuih pau* had changed the process at the end of the process which is to be frozen while preparation until the cooking method is just the same. The cooking method used is until the dough is let to grow. Principle 1 explained there is no formula modification occurred in the food. Principle 2 (process integration) gets low marks since there is no combination of any food inside the *kuih pau*. Then the principle 4 also gets low marks since the shape innovated with the same as before. Instant *kuih pau* is eaten as breakfast and tea time by the whole family.



Graph 5-19: The scores of the development of innovation *Kuih Pau*

In Graph 5-20 evaluation, the concept of innovation can be the same as frozen *roti canai*. The innovation of *kuih pau* got higher marks in several criteria such as the exclusiveness, commercial potential, simplicity of the process and shelf life of the products. The cooking method for *kuih pau* is using the same method as the original *kuih pau*. Through the observation, the authenticity of *kuih pau* has decreased a bit while the naturalness and healthiness/freshness remains the same. There is also no change in the structure of the food.

We can see that the innovation of *kuih pau* shows the highest marks in exclusiveness after the innovation had been done. Then, the commercial potential and shelf life of *frozen kuih pau* also has increased compared to the original *kuih pau*.



Graph 5-20: Pre and Post Assessment on the traditional and innovated *kuih pau*

5.2 Application of the system to develop a new innovated product

5.2.1 Background of the selected traditional food

Laksam (rice noodle) is a famous traditional food from the East Coast of Peninsular Malaysia. The noodles are traditionally made by pouring a thin rice flour batter onto a flat surface, steaming it, and then rolling and slicing it into 1 or 2-inch pieces. The steamed noodles are eaten with white and creamy savoury broth made from fish; chubs mackerel and sardine. (Tourism Terengganu Department, 2021). Both noodles and *laksam* gravy is eaten with *sambal* and fresh vegetables in small slices; long beans, *bunga kantan*, cabbage and others.

Nevertheless, *laksam* has several limitations on its production in Malaysia. First, traditional products are low in production scale. The products that are so famous in Kelantan and Terengganu made the production of *laksam* limited. Most of the expertise of *laksam* making is in a certain area only and all other countries lack exposure in the preparation. It also made the low product availability all around the country. The product also is lacking in commercial value.

5.2.2 Swot Analysis of laksam

Usually, the original *laksam* is sold by small entrepreneurs at small stalls or restaurants in their areas. In the SME's industry, many factors affect the success and failure of one product. This analysis was created to measure the strengths, opportunities, weaknesses and threads of the original *laksam* business in Malaysia.

Strengths

Laksam is a unique traditional food that comes from Kelantan and Terengganu. The uniqueness of this food which is almost similar to *laksa* made it a well-known traditional food in Malaysia. Even though it comes from the east coast of Malaysia, many SMEs take this opportunity to learn and make it famous among all citizens. It is mouth-watering delicacies to eat during tea time and lunch.

Weakness

However, the weakness of *laksam* is detected to be a cause of unsuccessful business. These products lack innovation and lack commercial value than other instant noodles. Nowadays, food innovation plays an important role in increasing the value of products. Most consumers prefer modernised versions of traditional foods to ease customers in many ways. The production of *laksam* is very low since it lacks expertise. Mostly, the experts are originally from the original states of traditional food. *Laksam* also has a short shelf life which can be consumed use-by-date.

Opportunities

However, these products have opportunities in order to generate successful business and have the potential to expand the product to the global worldwide market. *Laksam* can be processed into innovative products with the same original taste by undergoing a high technology process that suits every modern lifestyle. All the healthy ingredients used in the original *laksam* can also be processed and can be included in the innovated *laksam*.

Threads

The idea of innovating *laksam* is to be produced in the form of instant noodles and paste. This idea has high competition with other instant foods in the world. It has an intensifying competition for instant food, including other instant noodles. It also has the same appearance as other instant noodles which might give a perception from customers.

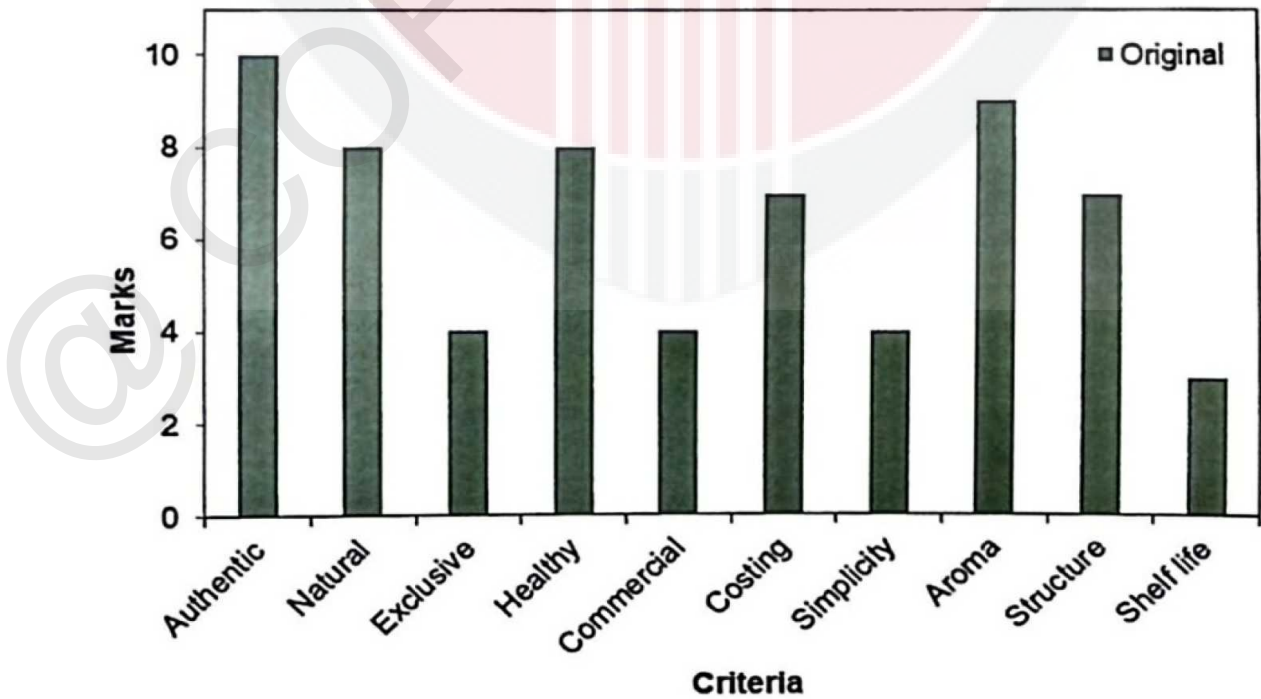


Figure 5-1: Swot analysis of original *laksam*

5.2.3 Stage 1: Pre-assessment of the original *laksam*

To identify to necessity for the original *laksam* to be innovated, it first will have to be pre-assessed by using the rubric developed in the system.

Graph 5-21 below shows the result of the pre-assessment in graph form. The first criterion is authenticity with 10 scale marks, meaning the product is made traditionally and highly authentic owns by its history. As mentioned above, *laksam* is special traditional food from Kelantan and Terengganu and it has a specific history behind it. The authenticity of food explains the history of food comes from and the traditional way the food is made. Second criterion is naturalness which gives 7 scale marks. This scale explained that *laksam* is made with organic ingredients with complex processes. All the ingredients used is organic ingredients; noodles (rice flour), savoury broth (fresh fish), *sambal* (chillies) and fresh vegetables. The process making of *laksam* seems complicated since the noodles and savoury need to go through a few steps of cooking process. Next, the marks for exclusiveness show at low range since the original *laksam* is made by traditional method and sold with unattractive packaging. This also contributes low marks on commercial potential of products. The last criterion shows the lowest marks among others. Original *laksam* have a short shelf life at room temperature and need to be stored in the refrigerator to increase the shelf life.



Graph 5-21: Pre-assessment on the original *laksam*

5.2.4 Stage 2: Innovation process of the *laksam*

Based on the output in Stage 1, I have identified a few potentials innovation principles to overcome the issues related to the original *laksam*. As the original *laksam* score was very low in simplicity and shelf life, these issues need to be considered when the *laksam* is being innovated in this stage. It seems that the Principle 1: formulation modification and Principle 3: processing approach can be used to overcome the issues. Hence, by following the guidance of the selected innovative principles, I have decide to convert the original *laksam* to be an instant *laksam*. Details of the production of the instant *laksam* is being elaborated below.

Production of Instant Laksam

The production of instant *laksam* produces *Laksam* noodles, gravy *laksam* paste, dried vegetables and coconut milk powder. *Laksam* noodles are prepared through flour mixing, steaming the dough, rolling and cutting the dough sheet, dry the cut noodles, cool process to ease the packaging section, and lastly packaging process.

Preparation of *laksam* noodles

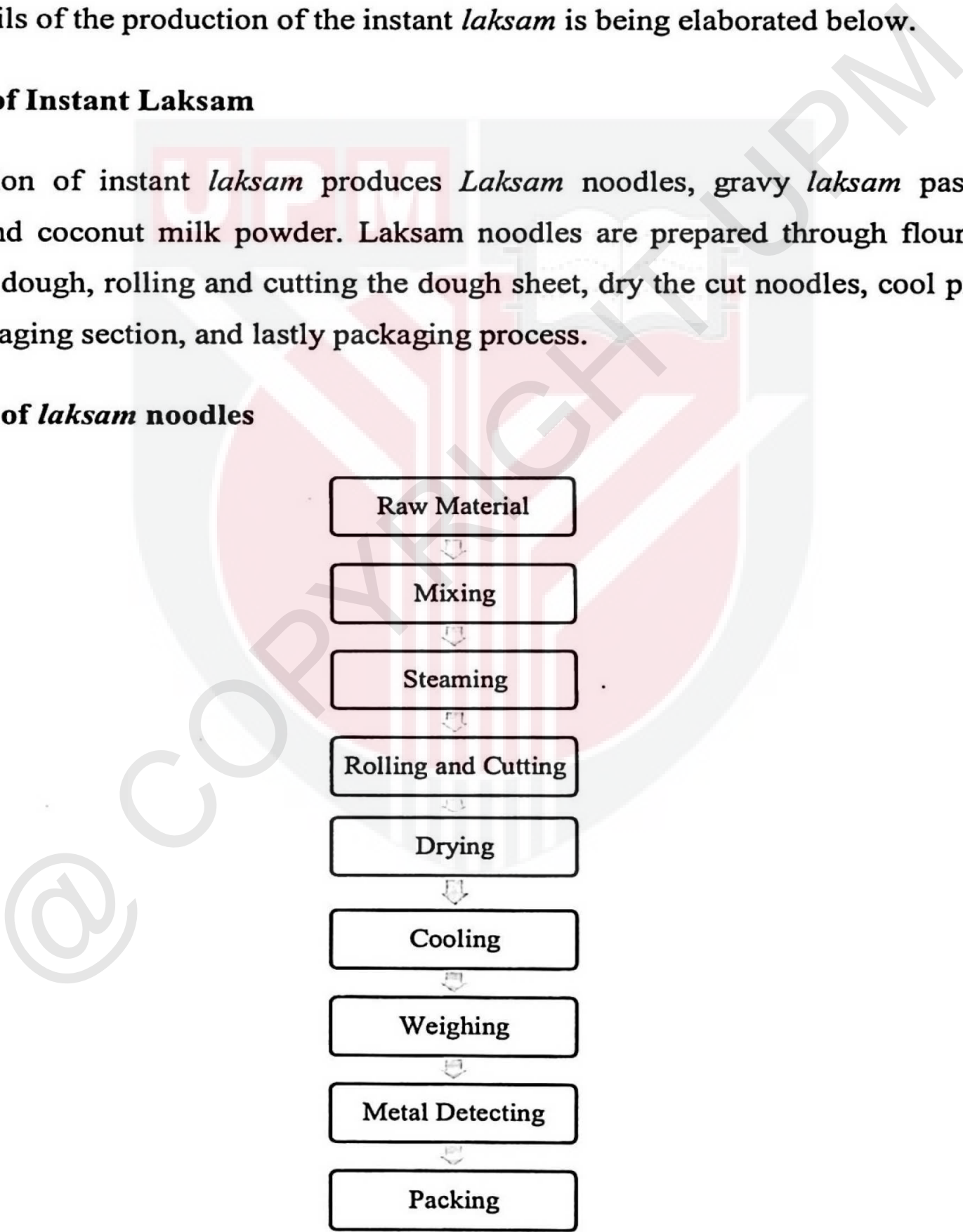


Figure 5-2: Flow chart of *laksam* noodles

Mixing – Flour Mixer

Receive the basic ingredient used to develop *laksam*; rice flour, wheat flour, water, sugar and salt. The flour is poured into the sieve according to the distribution's direction and sent to the mixer. The flour is mixed with an appropriate ratio and uniformly stirred with another ingredient with the addition of water until the dough loosens and elastics.

Steaming –Steaming Machine

Then the mixed flour in form of dough will be steam for several minutes. Through this process, the noodles can be easily slitted and form its shape. The steaming process is generated by a boiler which is introduced to a steam chamber.

Rolling and Cutting

After that, the dough will be flattened by pressing rollers until it reaches the other end of the steamed dough. The dough will form a dough sheet and continue by the conveying belt into the next process; cutting and folding. The cutting knives are set with the correct accuracy to give the best quality of the noodles after being cut. The rice flour rolls are cut 1 or 2 inches thick and follow the standard size for *laksam* noodles.

Drying and Cooling Machine

After the steam process, the rolled flour will be dried before being packed. After the drying process, the noodles tend to have lower moisture content. The noodles are send through noodle distribution conveyer into cooling machine to be cooled after going through the drying process. The noodles then is cooled with low temperature to meet the packing demand.

Packaging Machine – Weighing & Metal Detecting

The ready instant *laksam* noodles are then weighed and checked by a metal detector to ensure the product is safe. Lastly, the noodles is packed by packaging machine with LDPE plastic and sealing.

Preparation of *laksam* savoury paste

In this innovated product, *laksam* savoury will be processed to form a paste. *Laksam* savoury, originally a fish-based coconut milk gravy, will transform into a paste and coconut milk powder. The process starts with receiving the fish from the supplier comes from the wholesaler at pantai area in Kelantan. The fish used for the recipe are *ikan kembung* and *ikan sardine*. The fish will be stored in an insulated cooler icebox to maintain its freshness. It helps to ensure that only good quality fish is processed for further processing. The spice mix used in the paste production includes chillies powder, red onion, garlic, lemongrass, ginger, black pepper, seedless tamarind, palm sugar, salt, coconut milk.



Figure 5-3: Flow chart of *laksam* savoury paste

Sorting

After receiving fish from storage, the employed belt conveyor sorts the fish within 10 minutes. The fish are then separated automatically depending on their size, colour and condition. All selected fish and damaged fish are being removed. Sorting also enables any unwanted or additional material such as leaves, stones or any inappropriate raw to be removed.

Cleaning/Slicing

The fish goes through the washing process before flaking the flesh of the fish. Next workers will come to cut open the fish and remove all unwanted internal organs. The cleaned fish will be stored in a low temperature room. The workers work to flake the fish.

Grinding and Blending

After that, the fresh fish will be added into the grinder machine. After the grinding process, all the components at the grinder part need to be removed and cleaned manually. The minced fish flesh will be added into the mixer including all the other ingredients. The peeled ingredients are then blended in a blending machine into crushed form. Blending process also allows to mix all the ingredients evenly. In the blending process, a small amount of water is added to ease the process and make sure the blended ingredients are in paste form.

Mixing and Pre-Cooking

The finished paste is added into the mixing tank by sequence to undergo mixing and cooking process simultaneously. Mixing process is required so that the *laksam* paste is evenly flavoured and seasoned. Cooking is an important step to ensure the food is safe to be consumed. It is assumed that some water is evaporated during the cooking process.

Packaging

The final state of *laksam* paste is going through packaging process.

Sterilization and Cooling

The products are sterilized and cooled in semi-automated retort. It is being used to preserve the food product for up to 18 months without the addition of preservatives. The retorted products are then undergoing a cooling process.

Drying

After the retort process, the products are transferred to the drying room for the drying process. The drying process is carried out at room temperature to dry and remove the water accumulated on the surface of the packaging material during the retort process.

Flow chart of fried vegetables

Usually, *laksam* is served with chopped fresh vegetables as condiments. In instant *laksam*, all vegetables such as long bean, ginger flower, *kesum* leaves, cabbage and onions will be processed through a drying process to produce dry vegetables.

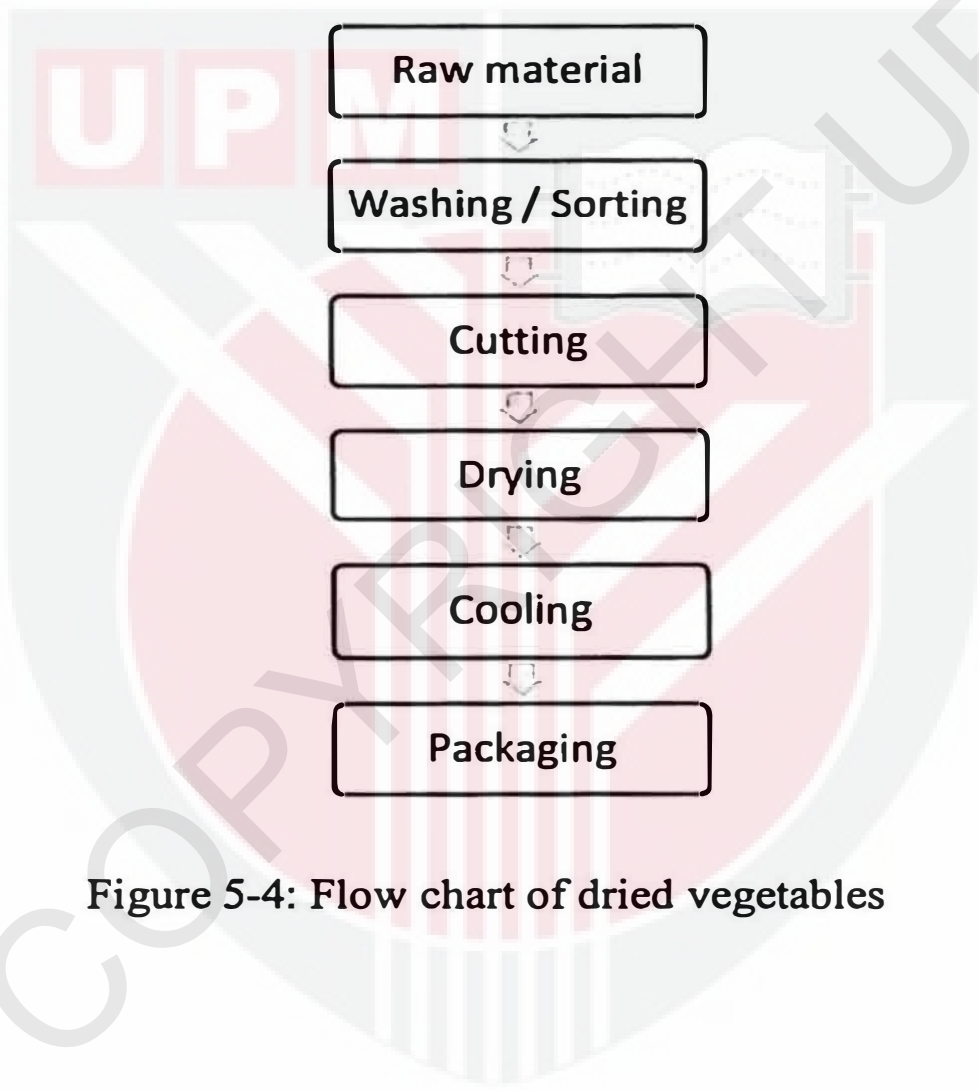


Figure 5-4: Flow chart of dried vegetables

Raw Material

Raw material received

- 1) Long bean
- 2) Ginger flower
- 3) *Kesum* leaves
- 4) Cabbage
- 5) Onions

Sorting & Washing

All the fresh vegetables are sorted to separate good quality vegetables and separate all types of vegetables. All selected bruised and damaged vegetables will be removed from the storage. Then, all vegetables are conveyed to the washer to continue the washing process. The vegetables must be cleaned to ensure the safety of product and spoilage from microorganisms.

Cutting

The vegetables are cut into smaller sizes which is performed automatically after the vegetables are inserted into a feeder. Then, the cut vegetables are mixed together with the same quantity ratio before being dried.

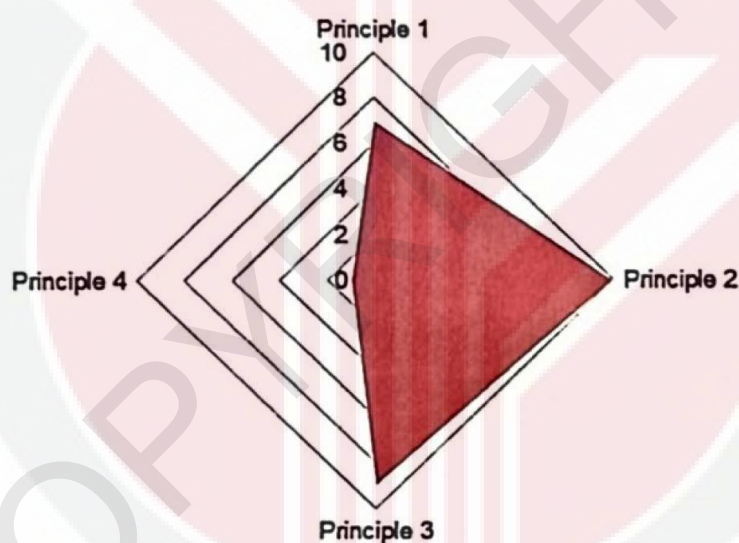
Drying

Drying process is one of the preservation technique used for the vegetables. This process can increase the shelf life of products and promote security of products. This is the process of removing water from vegetables by hot air circulation, inhibiting bacterial growth and preserving it.

Cooling and Packaging

After the drying process, the vegetables are cooled at low temperatures to ease the process of packing. The mixed vegetables slices are packed in the small LDPE package and are inserted with the whole *laksam* packet.

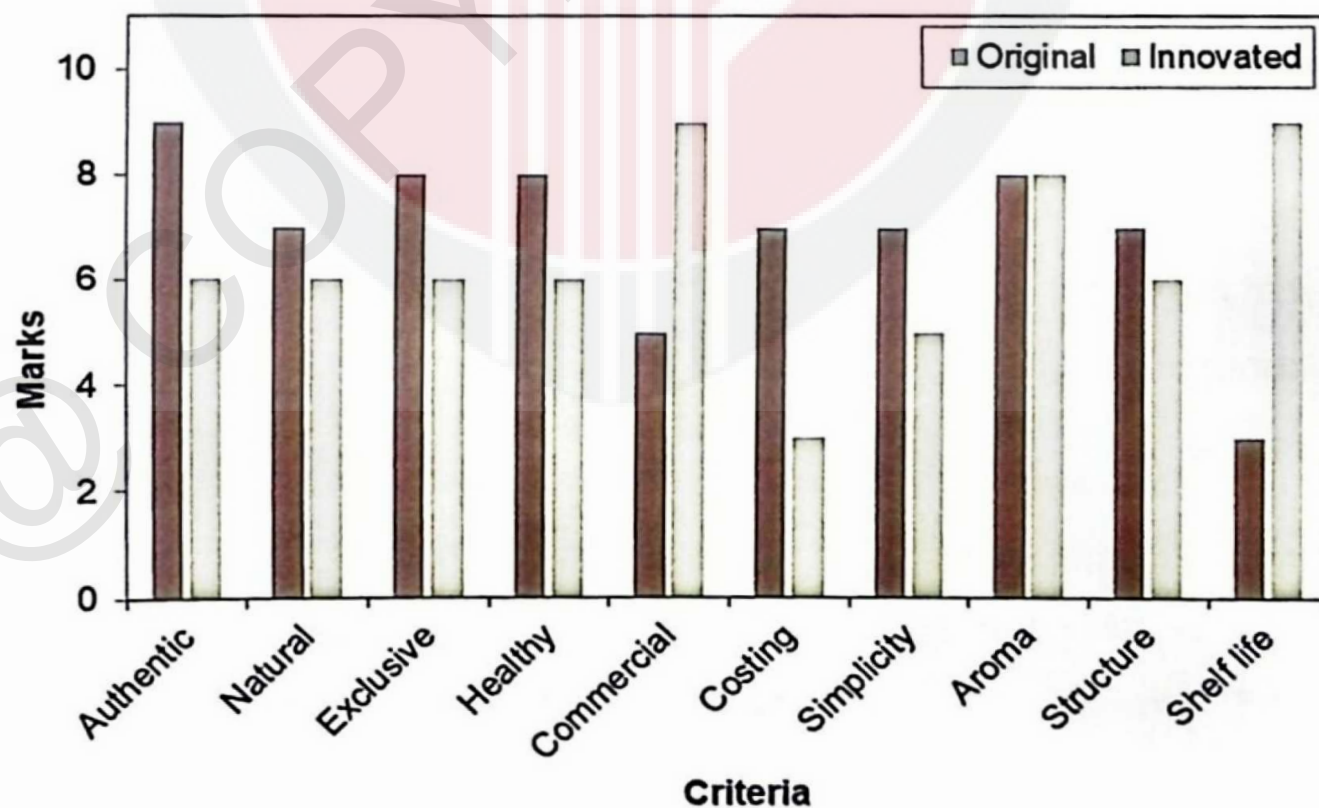
Based on the production of the instant *laksam* in Graph 5-22, the percentage of principle 1 and principle 3 show the highest marks. Principle 1 is formulation modification, which explains the original *laksam* that will be modified to produce *laksam* instant. The formula needs to be modified in order to produce a product with longer shelf life. In the original *laksam*, the *laksam* noodles are made in the form of wet noodles with a soft texture while for *laksam* instant, the *laksam* noodles are modified to form dried noodles. Principle 2 shows the highest mark in this evaluation where the integration between *laksam* and instant noodles happened. It is similar to the other side ingredients used in the recipe. The savoury of *laksam* is made from the flesh of fresh fish that will be boiled and crushed. For the innovation, the savoury is made in paste, which is in the flowchart below. In principle 3, the processing approach is at the highest percentage since the process of instant *laksam* is totally changed. It will be processed on a large scale by using modern technology. Next, principle 2 (process integration) and principle 4 (physical characteristics) show low percentage since the integration of products does not involve both criteria.



Graph 5-22: The scores of the development of innovation *laksam*

5.2.5 Stage 3: Assessment of *Instant Laksam* (after innovation)

The instant *laksam* has been developed in Stage 2 of the system. Hence, the product needs to be assessed again to measure the success of the innovation. Graph 5-23 below shows the result of the assessment of instant *laksam* before and after going through some innovation. The marks for the authenticity, exclusiveness and naturalness of the product have decreased a bit since the instant *laksam* was processed by modern technology which gives different vibes than traditional cooking methods. However, the making process still uses the same ingredients including the side ingredients used in the *laksam*. Therefore, the marks for healthiness are also decrease due to dried vegetables process in the instant *laksam*. This production gives a high score on the high potential to be commercialized in the market compared to original *laksam*. Instant *laksam* has several advantages; 1) convenience to be consumed by people who are busy with working life, 2) the production of instant *laksam* also can be sold all around the world and the specialness of traditional food which comes from Malaysia will spread worldwide, 3) easy to prepare and cook the food. The structure of instant *laksam* also totally change in dry and paste form makes the mark for the instant *laksam* drop a bit. It also gives high marks on structure and simplicity of product which ease the process of cooking. Finally instant *laksam* will have the longest shelf life from the date of manufacturing compared to original *laksam* after going through some high technology processing.



Graph 5-23: Pre and post-assessment on the instant *laksam*

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

An early stage development of a system that provides strategic approaches to innovation of Malaysian traditional food has successfully achieved in this study. This included the development of three stages in system equipped with rubrics; and the self-application of the system on selected Malaysian traditional food and a novel food product.

To fulfill the first objective of the project, the development of three stages of the system start with pre-assessment of original products was done. The results shows a set of rubric is created based on ten selected criteria. Next was the innovation principles based on identified issues. The principle is being introduced based on selected criteria. In each principle, a form of the rubric also is prepared as score guidance to innovate the food while the last stage of the system is a post-assessment of the innovated products by using the same rubric in first stage.

Meanwhile, ten innovated Malaysian traditional food in the market have been selected to achieve the second objective of the project as to self-apply the system in developing innovated food. The finding in this project suggest that all the selected products have been linked to at least one of the innovative principles in the system. Based on the procedures in suggested in the system, a new novel food has also been developed in this project which named as instant *laksam*. The production of instant *laksam* is possible by following the stages in the developed system with the aim to increase the commercial values and shelf life of the product.

As overall, the developed system in this project can be used for the innovation of Malaysian traditional food to increase their commercial values in the market. It is expected that this developed system can provide benefits to the food producers and SME as a guideline to get ideas on the innovation. It can help food developer or SMEs to improve their products by increasing the potential commercial of the system.

6.2 Recommendation

As this project only focus on the early stage development of the innovation system, more efforts are still required to validate the system particularly in the real industrial scenario. This can be done by asking the food producers to try the system in order for them to innovate their own products. Besides, the system will facilitate the user for food innovation in theory, hence the practical part of the innovation is also requires as to observe the practicality perspective from the outcomes of the system. The proposed innovated product needs to be physically produce and tested to validate the reliability of the system. Lastly, it is suggested to use SuperPro software to evaluate the product innovation in real large scale industry.



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APPENDICES

CHAPTER 5

Principle	Innovated Products									
	Chocolate Kapit	Lekor Cheese	Bahulu Inti	Karipap Carbonara	RTE Nasi Lemak	Roti Canai Frozen	Instant Ketupat Palas	Dodol Durian Stick	Popia Satar	Pau Inti Frozen
Principle 1	1	2	3	9	8	2	9	4	8	2
Principle 2	8	9	8	8	2	1	2	2	8	2
Principle 3	3	3	4	2	9	7	8	7	7	8
Principle 4	1	9	5	1	6	2	2	9	7	2

Table 7-1 and Table 7-2 shows the rubric marks for ten selected products on subtopic 5.1 Verification of the system on selected commercialized innovated products.

Table 7-1: Rubric marks for the ten innovated traditional food in the market (Phase 2)

*Marks given based on rubric in phase 2 (page 41)

Assessment of product	Chocolate Kapit		Lekor Cheese		Karipap Carbonara		Popia Satar		Dodol Stick		Instant Ketupat Palas		RTE Nasi Lemak		Roti Canai Frozen		Bahulu Inti		Pau Inti Frozen	
	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst	Ori	Inst
Authenticity	7	7	9	9	7	4	8	7	9	9	8	5	10	7	7	7	8	8	9	8
Naturalness	7	7	9	9	7	7	8	4	9	9	8	5	7	5	7	7	7	6	5	5
Exclusiveness	5	10	5	8	6	9	4	9	5	9	5	8	6	9	4	7	4	7	6	8
Healthiness	7	7	8	8	7	7	8	7	7	7	5	7	8	8	7	7	8	8	8	8
Commercial Potential	7	10	6	9	4	9	3	9	7	9	4	9	5	9	3	8	5	6	3	7
Costing	4	4	5	6	5	5	7	7	7	7	6	8	4	8	7	6	8	4	7	7
Simplicity of the process	5	9	7	7	8	8	4	6	4	7	3	7	5	7	8	8	7	7	9	9
Aroma	5	5	5	5	6	8	7	6	5	8	8	8	9	7	8	8	8	8	8	8
Structure	6	7	4	7	6	6	6	9	5	8	8	8	9	5	8	8	8	9	7	7
Shelf life	8	8	6	8	6	6	4	9	8	8	3	8	3	9	4	9	9	3	7	7

Table 7-2: Rubric marks for the ten innovated traditional food in the market (Phase 3)

*Marks given based on rubric in phase 1 and 3 (page 37,38)

Ori = original

Inst = instant

Table 7-13 and Table 7-24 shows the rubric marks for innovation of *laksam* on subtopic 5.2 Application of the system to develop a new innovated product.

Table 7-3: Evaluation marks for developing principles for innvoted *laksam*

Instant <i>Laksam</i>	
Principles	Marks of innovation
Principle 1: Formulation Modification	7
Principle 2 : Process Integration	10
Principle 3: Processing Approaches	9
Principle 4: Physical Characteristics	1

*Marks given based on rubric in phase 2 (page 41)

Table 7-4: Evaluation marks for pre and post assessment of original *laksam* and instant *laksam*

Assessment of product	Laksam	
	Original	Instant
Authentic	9	6
Natural	7	6
Exclusive	8	6
Healthy	8	6
Commercial	5	9
Costing	7	3
Simplicity	7	5
Aroma	8	8
Structure	7	6
Shelf life	3	9

*Marks given based on rubric in phase 1 and 3 (page 41)

LISTINGS

List of Proceeding

Maria Shahirah Jefriniza and Mohd Zuhair Mohd Nor (2021). Development of Strategic Approaches in the Innovation of Malaysian Traditional Food (SITRAF system), paper presented in the in the 2nd International Conference on Agriculture, Animal Science and Food Technology, On-line, 1-3 March 2021.

POTENTIAL PUBLICATIONS

- 1) Development strategic approaches for the innovation of traditional food (SITRAF) system: assessment and innovative principle
- 2) Innovation of Malaysian traditional food through SITRAF system: development of Instant *Laksam*