DESIGN OF HOME USED SEASONING POWDER PACKAGE

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กาจ โฆษิตรัตน์ : แบบบรรจุภัณฑ์ผงปรุงรสเพื่อการใช้งานในครัวเรือน (DESIGN OF HOME USED SEASONING POWDER PACKAGE) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ศ. ดร. ปารเมศ ชุติมา, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ธัญนนท์ รัตนเกื้อกังวาน, 107 หน้า.

การวิจัยและพัฒนาบรรจุภัณฑ์ผงปรุงรสเพื่อใช้ในครัวเรือนได้มุ่งเน้นไปที่การเสนอออกแบบและเลือกแบบอย่างเป็นระบบ รวมถึงการปรับแต่งความต้องการส่วนประกอบของบรรจุภัณฑ์ให้เป็นไปตามความต้องการของลูกค้าและความสามารถของบริษัท เริ่มจากการศึกษาวิจัยเชิงคุณภาพผ่านการสนทนากลุ่ม เป็นผลให้ระบุได้เกี่ยวกับความต้องการในการใช้งานบรรจุภัณฑ์ผงปรุงรส ที่ซึ่งกลุ่มลูกค้าเป้าหมายได้แสดงให้เห็นถึงปัญหาและความต้องการของบรรจุภัณฑ์ที่มีฟังก์ชันการผนึกป้องกันความชื้นเพื่อใช้ซ้ำ ยิ่งกว่านั้นความต้องการที่ระบุได้เช่นความง่ายดายและรวดเร็วในการผนึกซ้ำรวมถึงความสำคัญในการเห็นผงปรุงรสถูกโรยระหว่างการใช้งาน ผลจากการสนทนากลุ่มได้นำไปสู่แนวคิดแบบบรรจุภัณฑ์ซึ่งมีฟังก์ชั่นที่ตอบสนองต่อความต้องการข้างต้นผ่านนวัตกรรมที่แตกต่างในหกแบบไปสู่ฟังก์ชันของแบบที่เพิ่มความสามารถในการผนึกซ้ำและการเทใช้งานที่ดีขึ้น รวมถึงคงความต้องการพื้นฐานของการจัดเก็บไว้ในรูปแบบซองและขวด นอกจากนี้การวิจัยยังได้เสนอเกณฑ์การเลือกหนึ่งในหกแนวคิดเพื่อเป็นพื้นฐานของการออกแบบ หลักเกณฑ์ได้ถูกแบ่งเป็นสามด้านคือด้านการใช้งาน ด้านการตลาด และด้านความสามารถในการปฏิบัติการ โดยเกณฑ์ทั้งสามด้านได้ถูกแบ่งย่อยและถูกให้น้ำหนักความสำคัญที่แตกต่างกันออกไปด้วยกระบวนการเลือกพัคเมทริกซ์ ในส่วนสุดท้ายของการวิจัยการออกแบบบนความต้องการในระดับชิ้นส่วนถูกวิเคราะห์และพัฒนารวมไปถึงการปรับเปลี่ยนแบบหลังทำการทบทวนแบบ

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The research in the design of home used seasoning powder package focuses on the systematic approach to generate, select idea, and refine the component requirement of the package according to the customer need and company capability. The research qualitatively indicated the knowledge of the usage requirement of the seasoning powder package through focus group, in which the quick resealing, effortless resealing, and the dispensing off the side of the package is the critical finding. With the ethnographic knowledge produced from target customer voice, 6 design concepts, which hold the function that responds to the usage requirement has been generated. All concepts employ innovation of reseal mechanism, and retaining the storage function through conventional package form as sachet and bottle. Moreover, the research has conducted the selection of the concept. With the criteria in three aspects, which are the usage, marketability, and operability. Through the use of Pugh Matrix, the weight the sub criteria and its weighting has been designated according to concern and constraint from both customer and manufacturer side, which resulted in the best concept as the “Sticker side reseal pouch design”. With the close scoring on four concept namely “Sticker reseal”, “Spice lid”, “Modular sachet”, and “Zip reseal”, the Failure mode and effect analysis were conducted based on the best concept as well as ensuing the improvement of the good point from closing concept. The final result of design has been refined to the component level through the process.

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Chapter 1: Introduction

1.1 Original Business: Chemical Raw material distribution

Chemmin Corporation Ltd. is a Thai company established in 1979. The Company's main business involves importing and distributing of chemical raw material in bulk to many various domestic industries, which include Polymer, Rubber, Latex, Food, Cosmetic, and Ceramic. The company employs a number of sales for each product category and traditionally corresponds to customer through the direct sales channel. Majority of the customers are the consumer product producers from small to large scale. From the current stated customer group, the company has relied on cost competition and ability of supply sourcing.

1.2 Decision of moving toward end product

It is considered from the pass 35 years that Chemmin original business was based solely on distribution services. By the current higher competition and the opening of ASEAN Economic Community (AEC), the increase in the competition is unavoidable; moreover, with a low barrier to entry of such business, the company could face the difficulty if continuing on the traditional approach. On the other hand, in a past few years the production technology has improved greatly, this resulted in the advance production capability on the supplier side, in the other word, from the current pool of supplier sources there are more complex product with competitive cost available, some with high potential to open-up new market where the company could seek an advantage from. From these reasons, there is an apparent pressure for the company to initiate into a new market through value adding of product coherently with supplier technology.

1.3 Targeting Food Product Section

From the first information, it is validated that the requirement of new product is essential for company growth. The following BCG matrix has been employed to map the type of product "Chemmin Corporation" is currently and will be employed in near future.

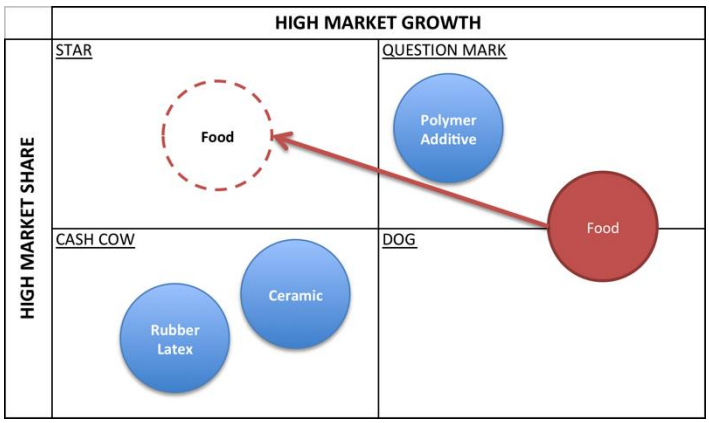


Figure 1: BCG Matrix of Chemmin Product range

(Modified by the other, from BCG matrix)

With the traditional indent sales and trading of chemical raw material in each product category retained as the cash cow, the original product range is kept for funding for further investment on new food product, which has higher promise of return than increasing market growth of original product (Michael J. Baker, Susan Hart, 2008).

From Figure 1, the highest potential product category would be in food area. There are two reasons to consider food is of higher potential comparable to other categories. The first is the variety of supply product available abroad i.e. Alternative ingredients, and Ingredient that is limited or not available domestically. The second is the variety of consumer behaviour; evident from a wide variety of restaurant or type of food provider available in Thailand. From the decision of the marketing direction, the company has sourced 3 products to cover the range of customer from household family to service segment. Some of the product has also been branded and packaged through a small sealing machine purchased for trial.

Potato Starch: Higher quality than available Cassava starch which has been used extensively due to the price and limited supply of potato starch. However, competitive and reliable supply source is realised.

Seasoning Powder & Sauce: Competitive supply available in term of cost to quality of product. This product holds potential for household customer especially seasoning powder. However, the packaging for retail has not been studied.

Dry noodle: Many alternatives form and ingredient. Focusing on end-customer rather than food store/outlet. This category is to generate higher margin through differentiation.

Out of 3 potential products, the seasoning powder product has been chosen for household market penetration.

1.4 New package food product strategy

1.4.1 Current position

With the company focusing on the seasoning powder for household customer, the current external situation and the company's internal performance, SWOT and TOWS were required to be studied and have been given as following Table 1 and Table 2 respectively.

Table 1: SWOT Analysis

Strengths	Weaknesses
- Reliable supply source - Strong buying power - Chemical raw material distribution cash cows. - Experience in direct sales to producer (skill, personnel, and performance management)	- No experience of direct sales to end customer (consumer promotional mix). - Lack packaging capability and logistic. - Lack Specific business unit to set-up product (organization of people).
Opportunity	**Threats**
- An unexplored supply of complex (higher level of product), with competitive cost performance. - Trend of increase in culture variety through opening of Asian Economic Country (AEC), thus demand on the food variety increases.	- Potential new entry of chemical raw material distribution business through AEC. - A strong defending of the current market of new food ingredient product market leader.

Table 2: TOWS Matrix

	Opportunities	Threats
Strengths	- Retain and highten the standard of traditional indent direct sales. - Use buying power for taylor the new food ingredient product to match customer need.	- Retain resources in the chemical raw material sales department at the same time, allocating new resource for new food product range separately.
Weaknesses	- Unknown about market situation (customer need) - Unable to deliver the final product due to incapability in consumer product promotional mix, packaging operation, and logistic to deliver to the right place for right customer.	- For new food ingredient range of product, avoid direct cost competition with current large market leader. Seek competitive advantage through value adding.

From the first evaluation of the current SWOT (Table 1), it can be seen that the most prominent problem is the operational aspect of introducing a new product to target customer, which in this case, the seasoning powder customer. The problems requires the study of the marketing research in the subject of food ingredient consumption characteristic of Thai, which needed for the lead to the planning of a range of promotional mix as well as brand to be put forward to a specific target market and gain share where the major market leader has long occupied. Moreover, TOWS matrix (Table 2) suggests that, it is appropriate for the company to avoid direct cost competition; therefore the strategy for new product would be the product differentiation.

Moreover on the market competition side of the seasoning powder product, the information taken from Thailand Food industry as of 2012 (Figure 2) shows that 71% of Thai seasoning powder customer is home use, with only 3 main major companies taking as much market share as 98%. This further validates the strategy of product differentiation to create new market.

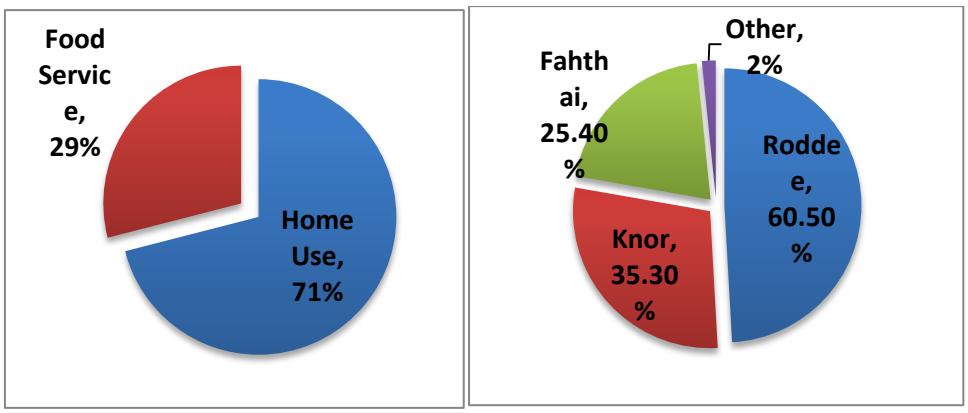


Figure 2: Thai seasoning powder market share and customer type

(Modified by the author from Thailand Food Industry, 2012)

Driven by the differentiation strategy, the company sets the direction on the packaging of seasoning powder to attract new premium market.

1.4.2 New product positioning

With the idea of introducing the differentiated seasoning powder product to a more premium market, the company has established Camilia Corp. as the registered company and started the development of 2 standard seasoning powder flavours, which are pork and chicken. The target flavour to be introduced to the market is 4 flavours including Beef, and Mushroom as for future plan.

Serving the premium market, all flavour has been developed strictly without the content of monosodium glutamate (MSG), low salt, and emphasise the natural ingredient, in which the marketing has identify the mentioned quality as an upper market's need.

Moreover, with the emphasis of a more premium ingredient, the pricing and package size has been identified. Two content sizes, which are the 90grams for 10 uses, and the 150 grams for 16 uses were set with the recommended retail price (RRP) of 44 and 79 baht accordingly.

On the selling channel, the company aim to employ the sales through retailer and distributer as a main channel to build the brand, anyhow the direct traditional trade channel is also to be employed fully.

On the expected sales, the marketing research carried out by the company has indicated the potential demand of 100kg per day at the first 6 month, and also the future aim of up to 1.5ton per day as a future target.

1.4.3 Target Customer

From the research carried out by Chemmin Corporation, the target market has been set to be within Thailand, which is due largely to the limitation of production and sales force capacity. Moreover, with the limited investment capital comparing to the direct seasoning powder competitor, the head-on competition is not possible. Therefore the differentiation positioning strategy has been taken. The target customer is no longer covering all customers who frequently cook for their family, but narrowing down to Thai customer who looks for a solution to improve taste of his/her cooking while minimising the time and effort in cooking. This therefore resembles the needs of young adult who moved out from family, or newer generation of family. Therefore the target age of the customer is from 27 to 35 both male and female.

1.5 Packaging Strategy

Firstly, the functional aspect of the packaging is to offer a new “Delight” attribute, in which the aim is to become the industry standard function and accepted as a function that is truly useful and could influence the buying decision of the target customer group. For this, customer usage information along with the usage problem must be identified from the customer itself to secure the model of customer needs driven development.

Secondly, the packaging design must be feasible for production, i.e. retaining the basic attribute such as size, manufacturing capability, and cost based on the evaluation of employed innovation change point.

To realise both of the package solution, the overall strategy of new product must be first identified. Following Figure 10 shows the Business model canvas of the overall new seasoning powder intended strategy set by the company.

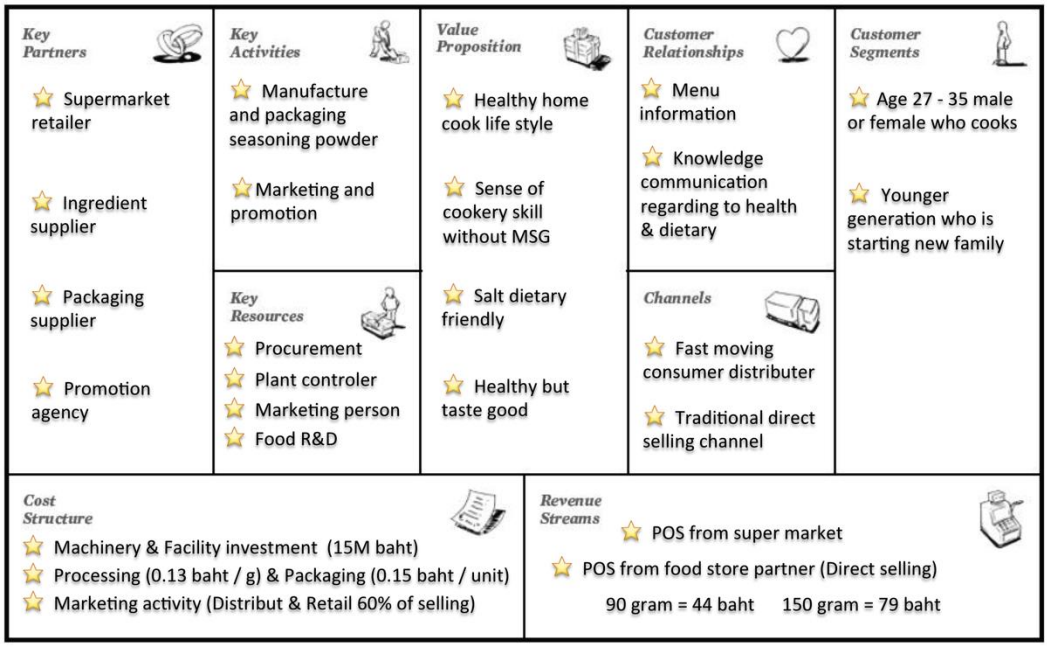


Figure 10: Business Model Canvas.

From Figure 10, after all strategy aspect has been confirmed regarding to the value, the ideal package must align with every part of value as much as possible.

Chapter 2: Literature review

2.1 New Product Design Process

One of the first frameworks to be focus is related to the process steps in the new product design. The concept of Quality Function Deployment (QFD) can be used to translate the wide requirement from customer to the design (Davide Maritan, 2015).

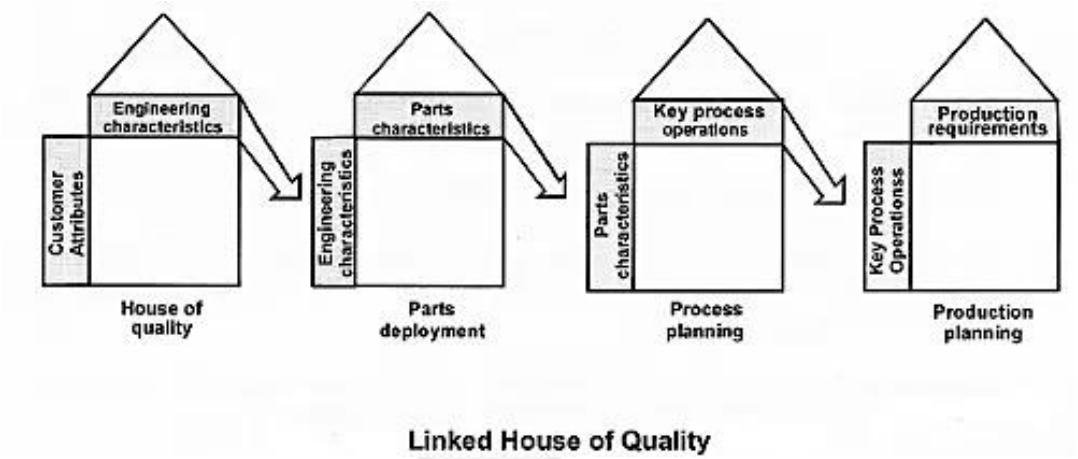


Figure 3: House of Quality

(Taken from the Internet source by the author)

As for the scope of this research, the employment of QFD house of quality as shown in Figure 3 will be done on first 2 house to give the design requirement until part and component.

Anyhow, looking on the more generic process in detail, the new product introduce in the market will not be easily defined as it involve detail work of grasping need, evaluating, and assessing the feasibility for the design. The framework follows the concept of Knowledge Funnel (Roger Martin, 2010).

The model suggests the fact that the value that has not been realised is wide range, unless narrowing down using heuristic approach to create the systematic design solution.

Moreover, Roger Martin discussed on the approach of capturing the value by questioning qualitatively as opposed to the quantitatively data gathering given the reason that new innovation deals with un answer need, not the improvement or evolving approach.

Therefore, this concept is coherently agree with the QFD process framework, and could be used as an approach to realise the innovative design to solve current usage problem of seasoning powder package.

2.2 Method in grasping the customer needs

The author has researched into the journal regarding to the new product development to in small company (Huw Millward, Alan Lewis, 2005), where 3 cases study were done on the small manufacturing company that introducing the new product to penetrate the market, inorder to find the common barriers to successful in new product development. Even though the case study done by H. Millward, and A.Lewis are not directly related to the new differentiating seasoning powder product of Chemmin, many aspects of issues of each case studies has founded to be similar to Chemmin case regarding to the development of the new product. On Chemmin case, which is a family own company, there is an evident that the company is striving of to achieve a new packaging food business unit, the company has evaluated the business case based on the opportunity offered from supply technology i.e. a license of product distribution.

However, the new policy of the organization towards new packaging food business has been announcing based purely on expertise in marketing and entrepreneurship. Despite the requirement of introducing the product closer to end customer (home use customer,

rather than traditional manufacturer) the study of the end product value (the design of the product) and the level of product variability for customer has not been carried-out. Instead, some of the proposed product value has been design by trial & error from the staff in-charge of the project regarding to the packaging design, and quantity, in which the action has been carried out based on the owner dominant influence, where cost and time are main concern.

According H. Millward, and A.Lewis's cases study, this is the first common barrier to prevent the systematic design of the new product to achieve the requirement of the customer. Moreover from the product design uncertainty in value adding element, it also disrupt the flow of the manufacturing process design, which result in wasteful warehousing of raw material, lack or over packaging into finish goods, untimely delivery, and ultimately unneeded value of the product to the original intended customer. This down side has also identified by H. Millward, and A.Lewis, where the lack of communication between the product design and operation design causes barriers in developing new product. With the hit-and-miss approach on Chemmin trials products, it is evidently shown from the stockpile of packaged "Glutamates", and "Dry Noodle" (The previously trial product), as well as the company moved the "Potato Starch" back to the indent sales; a bulk sales which is the same approach as chemical distribution business, where there is small margin of profit.

In the temporary decision driven by cost and time to solve the situation. With the similarity of issue, the author reviewed the suggestion of H. Millward, and A.Lewis, where the requirement of each stage beginning from the customer, design, and production should be defined, as well as being transparently visible from each stage, in order to promote prompt and accurate decision by the owner.

From the review of the literature from H. Millward, and A.Lewis, incorporating with the case situation of Chemmin, it is important to understand the fundamental of problem faced by the target group. First stage is to understand the customer group, and their choice towards the product.

One of the methods that can be used to identify the customer choice according to Kotri A. 2006 literature is through the conjoint analysis method. In the realm of new product development, the similar packaging product in term of function could be used to determine the customer need breakdown into component level, with the customer ranking the most value in his/her perception. This method is considered to be more efficient than traditional questionnaire in the way that the customer could experience on the actual packaging product and make decision as they would in actual purchasing scenario. The example of the application has been used by (Tunyarut Jinkarn, Prisana Suwannaporn, 2015) in “Trade-off analysis of packaging attributes for foods and drinks”. The similar product-packaging specimen has been put forward for the customer to rank, in which each type denote the key feature that the observer need to study. The example is shown in the following Figure 7.

Figure 4: Conjoint analysis specimen for a prefered snack packaging.

(Photo taken from Tunyarut Jinkarn, Prisana Suwannaporn, 2015)

Similarly to the seasoning powder packaging study, the different product with key feature packaging such as Smint candy packaging with an easy retracting of candy could be used to compare with other candy packaging on the similar product with other packaging key features. This method of study holds potential to quantify the customer perception of value, which may lead to the accurate decision down the stage i.e. process design of new product development.

2.3 Framework to drive the development of the new packaging

For the following stage after the product design requirement is fixed, the requirement is transfer to the stage of production process design. During this stage it is essential to identify the detail of the new packaging. According to R.C. Coles B. Beharrell (1990), “Conceptual model of packaging innovation” there are many driving forces for the change of packaging, in which manufacturer must considered (refer to Figure 5 next page).

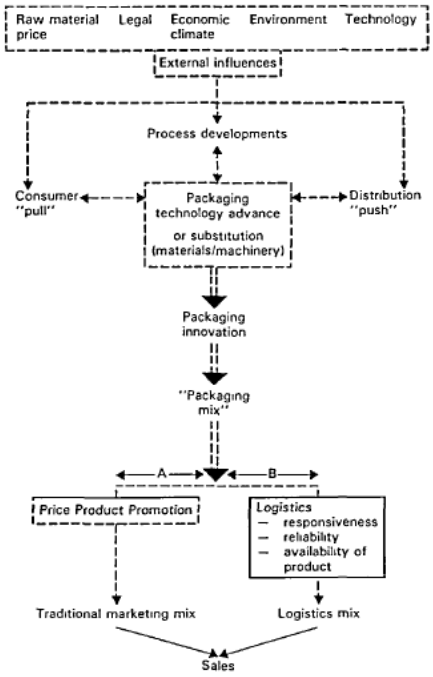


Figure 5: Conceptual model of packaging innovation

(Taken from R.C. Coles B. Beharrell, 1990)

It can be seen that in the case of new seasoning powder product requirement would be the consumer pull to drive the innovation and also to drive the marketing mix for sales, contrary, a strong enough influence from consumer could drive the packaging technology or process development as well, thus the available process to deliver the similar current packaging of the product must be understood clearly in order to identify or convincing either internal or outsource investment of change for customer requirement.

Another consideration given by R.C. Coles B. Beharrell, is regarding to the packaging development activity concept (Figure 6)

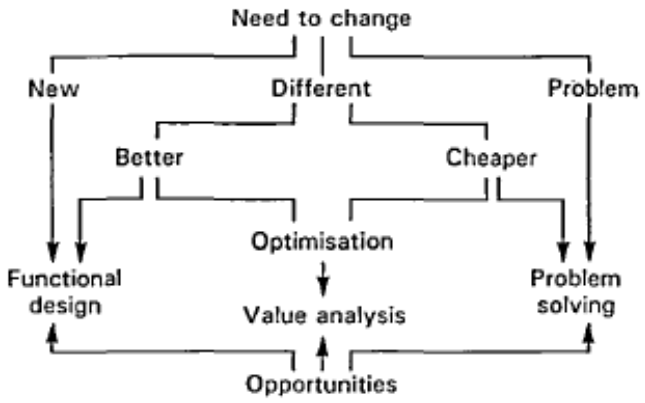


Figure 6: Packaging development activity.

(Taken from R.C. Coles B. Beharrell, 1990)

This shows the type of influence, whether the requirement of packaging changes or innovation is based on function, value, and/or existing problem solving. To identify the approach, the base method of production a specific required packaging should be studied, then the change type could be identify according to cost of implementation against benefits in term of product value, thus in this case, gathering the current detail production method of similar product or packaging maker can be a good starting point for cost to value analysis of the new seasoning product.

2.4 New Seasoning powder Packaging value proposition

In this section, the desire role of packaging to be developed will be reviewed. Before any product strategy can be set, various affecting performances must be reviewed. This includes both manufacturer and customer end aspect of the related performance.

2.4.1 Functional aspect (Customer Side)

Considering the image of the new product to be put in the market under the differentiation concept, the packaging holds the key to the new value for customer.

In order to scope the value of the packaging accurately, the target customer must be identified. In term of the overall function of the seasoning product, the core product features such as taste must be noticeably be above of the competitor in the market, which is the marketing target by Chemmin. However, to shift or attract the purchasing decision of target customer from conventional brand, the alternate packaging design must be considered.

With a requirement of the alternate packaging, the focus research and design of the packaging function is of concern. Function such as shape, colours, and graphic are the first aspect that has usually been targeted by the manufacturer. The evidence is from the observation of any new consumer product being introduced to compete in the market that the product is existed. Example includes the introduction of new cereal brand, which changes only choice of graphic to convey either it is fun, or it is healthy, however the core packaging is the same. This is contrasting to the product such as the wet tissue paper, where the different function such as the sticker seal that retain moisture in the product signifies the new and better overall function of the product.

Similarly to the example above, the packaging function of the new seasoning powder to be introduced will signify a total new product experience to the target group.

Upon the reviewing of the food packaging function, Tunyarut J. has conducted and produced an essential conjoint analysis regarding to the desire function aspect.

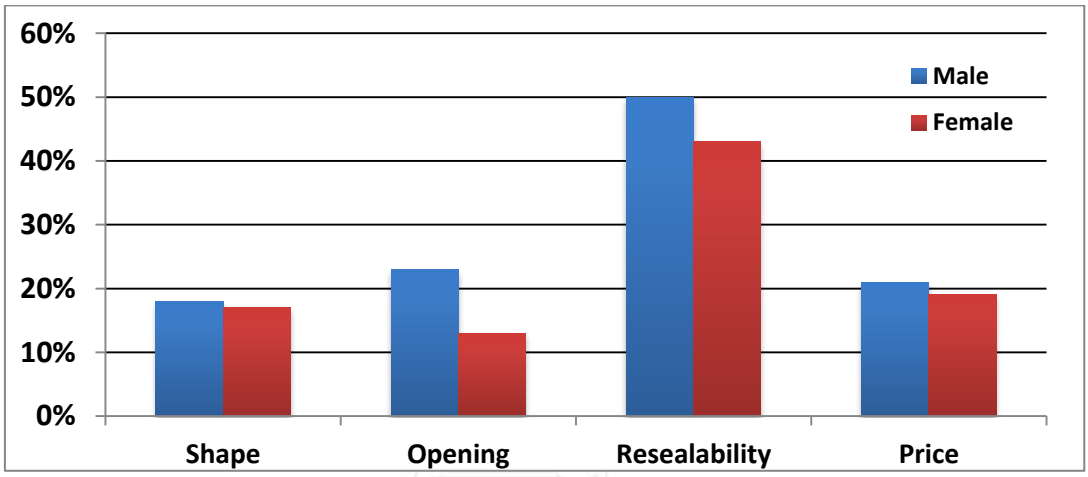


Figure 7: Conjoint analysis result on Thai customer preferred food packaging

(Taken from Tunyarut Jinkarn, Prisana Suwannaporn, 2015)

The result of the research provide the guideline towards the characteristic that should be incorporated with new product i.e. reseal ability and opening. Therefore, the target of the design can be scoped down to focus on the reseal ability to introduce the function of safekeeping while retain the “easy to use” characteristic.

Moreover, with the comparison of the author finding from the focus groups and the reference information of conjoint analysis by Tunyarut J., the objective of design is not only to introduce the reseal function, but also to ensure there is minimal effects on other function. In the other word, the function such as pouring, sprinkling, and other handling of the package must be retained.

2.4.2 Operational Aspect (Manufacturer Side)

Not only the package function itself, other aspects of the package such as operational performance of manufacturing, and logistic must also be consider to be as competitive as other product bench mark. Thus the target related to the operation must be qualified as feasible.

The target of operation performance required for the new seasoning powder package is therefore set against the current market deployed package “5-Performance objectives” (Slack, 1990) as shown in Figure 6 below.

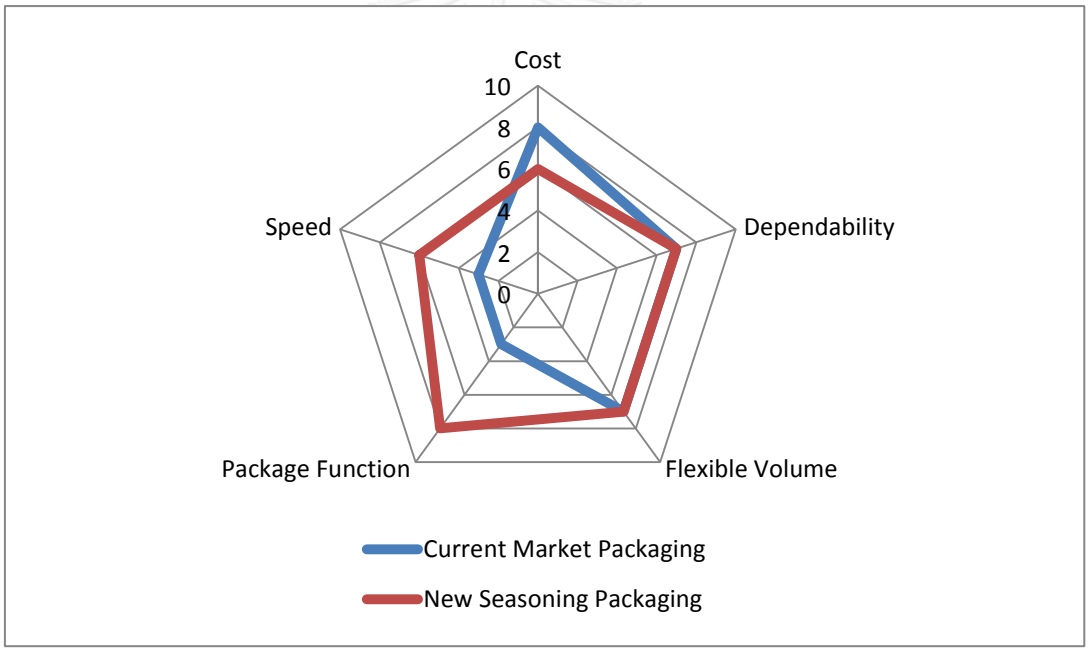


Figure 8: Polar Diagram for 5-performance objective of

(Created by the author)

It can be seen from the figure that the “New seasoning powder” requires the introduction of “Packaging Function” to solve the seal and reseal problem of current seasoning powder package. Moreover, “Speed” of new product introduction is required to effectively respond to the competitor who is with capital advantage. At the same time, the performance of “Dependability” and Flexibility in Volume must be retained.

However, with the increase in the performances, the tread-off with cost will occur. The conventional packaging must be redesign employing and implementing various innovations to overcome the performance target.

Each of the operational performance stated must be thoroughly compared for any design proposal evaluation.

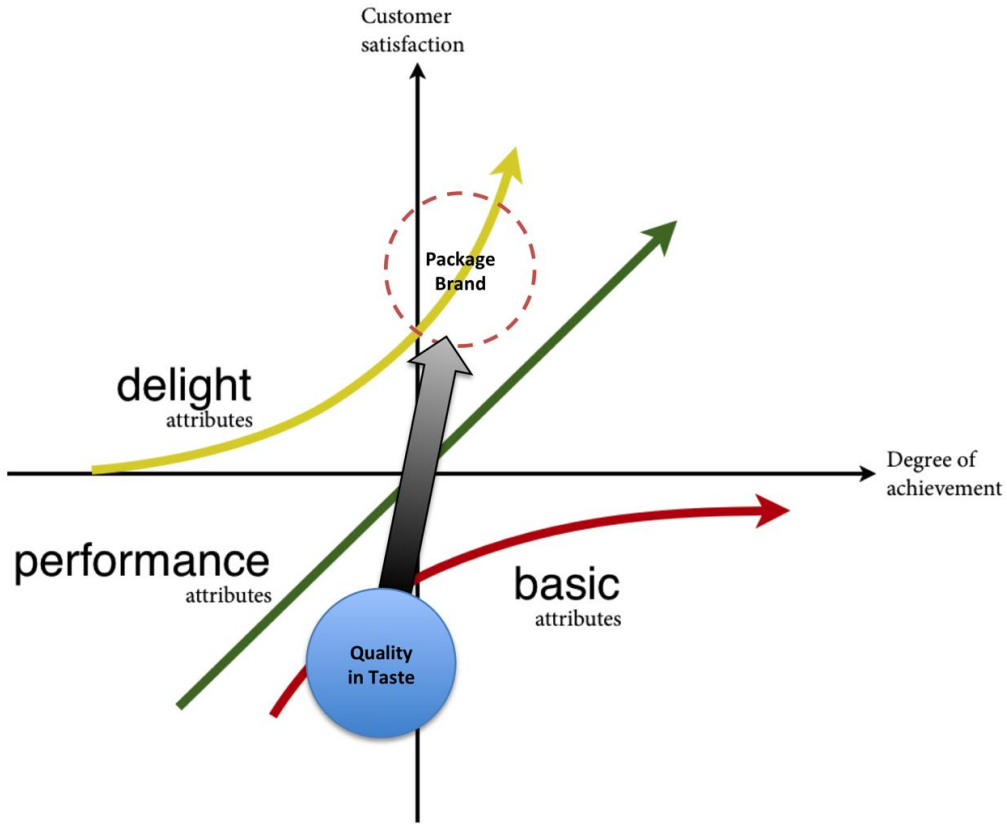


Figure 9: Kano Model for “Seasoning Powder”

(Figure taken from the Internet, modified by the author)

With a goal of improving the product for end customer, the company seeks to be competitive from the improvement of customer satisfaction through high packaging functional such as seal ability and easy to use as initial idea. This attempt is to increase the customer satisfaction factors effectively base on Yang’s revised Kano model (Yang, 2005). However, the basic must-be has not been thoroughly studied i.e. where to buy,

and what is the appropriate quantity of package may cause an in effective fulfilment in term of degree of achievement. Further detail of how the company plan for product packaging functions, its design process, as well as the unit quantity.

Chapter 3: Methodology

3.1 Secondary Data Research: Bench Marking the Package

In order to define the new packaging for seasoning powder, the current market environment must be understood. This refers to both the seasoning powder package that is available in the market, in which the maker has been providing to customer, and the customer voice of the available package. The requirement can then be indicated accurately from both maker and customer perspective.

3.1.1 Benchmarking of available packaging in the market

Upon the new introduction of the packaging design on the common commodity product such as the seasoning powder, it is essential to clearly understand the industrial decision process of arriving on the specific design, both in term of the function of the packaging, and the cost.

It is the fact that the characteristic of seasoning powder product would compete in the market on the cost. However, it is unavoidable for the product package to have some degree of function evidently from the observation of the existing seasoning powder package.

A simple procedure of actual checking the market place for seasoning powder and spice package has been carried out for the initial benchmarking process.

As the result of market place observation, the most common type of the seasoning powder is the sealed sachet, in which it includes the packaging function such as the airtight seal of the initial packaging (either re-sealable or non resealable), the slit for tear on the side of the package, the stand ability of the sachet depending on the quantity of the package, and the non-stick inner surface of the sachet etc.

All of the stated physical functions of this specific seasoning powder packaging would incur the manufacturing cost however unavoidable, since the stated function has long transformed from “delight attributes” to “standard attributes” based on Kano model (Yang, 2005).

Base on this idea, various functional packaging designs could not simply be proposed due to the limitation of cost and manufacturing technology. Moreover, assuming that the customer needs of a specific packaging function design is known, the design task still remains suboptimal since the target performance of the specific function could not be evaluated into the perceive value to weight against other criteria such as cost and manufacturing capability.

One of the initial design processes is to benchmark with existing product. The perceive value of existing packaging design attributes of the existing seasoning powder in industry must be identify together with the product positioning, before the decision of design attribute to be introduce or improve can be identify.

Once the design function attribute to focus is identified, the target design can then be quantitatively set with the specific performance of each attribute.

For benchmarking, two aspects are of concern, first is the available type of packaging being employed in industry, second is the function attributes of packaging powder

For the aspect of available packaging in the industry, focusing on the consumer grade seasoning powder package, the observation on the type of packaging are as follow.

Foil Sachet

Foil sachet is one of the most common seasoning powder packaging that could be seen in the market. It is the cheapest and simplest in term of manufacturing.

As for the aspect of packaging function, one of the advantages is the long shelf life, since the package is completely sealed. Another advantage is the shelf space, in which the slim pack can be stacked in unit box on shelf, or some retail may provide the standard shelf size.

For the disadvantage, in larger volume package, it is difficult for the end user in term of storage after first use. From user point of view, to avoid humidity and caking of seasoning powder, user needs to wrap the top torn sachet with rubber band. Another disadvantage is the handling while in use, which can be seen when pouring powder content off.

In summary of conventional Foil Sachet type of packaging, the benefit on manufacturer side dominates due to the cost effective and logistic aspect. However, once the packaging reach customer, only the main function of the containment and storage are presence.

Standing pouch with reseal

This form of packaging introduce on the larger quantity and more basic flavour of seasoning powder product. The advantage of shelf life is retained similarly to the Foil Sachet type. However it is with the trade-off of shelf space, and manufacturing cost.

The major advantages on this type of packaging are the functions offer to the customer end. It offers the reseal ability and stand ability. With the stand ability, the end customer can put the package in reach without taking as much space on kitchen top as rubber band wrapped Foil Sachet. Moreover, the customer could quickly see and grab for use due to the visibility of standing package.

Another obvious advantage regarding to this type of packaging is the reseal ability, which reduce the time in unsealing and sealing of the package away from humidity before and after use.

In summary of this type of packaging, the function for customer is obvious, however the utilisation of the function largely depends on the frequency of the customer end on using the seasoning powder for cooking. This shows that the reseal standing pouch is more suitable with the standard seasoning powder flavour that is generally used on most dishes.

Plastic container with large pop-up lid

Plastic containers with pop-up lid offers customer an easy access, shelf life and stand ability similarly to the Standing pouch with reseal, moreover its target customer is also similar in the function point of view.

On the shelf, the package design is usually with aluminium sealed lid similarly to instant coffee glass bottle, however the outer lid is with a large size pop-up lid providing access to content.

This simple design gives competitive in term of production cost and logistic while retaining function of stand ability.

In the aspect of customer end's usage, even though the pop-up lid is easy to access, it does not provide the seal performance at the level as reseal pouch. Moreover, in the case of high humid market, the caking of seasoning powder is unavoidable. Thus usage of scoop spoon would be common tool required for use, unlike the sachet and pouch option, in which the customer can seal or break the caking before use.

In summary of this type of packaging, the manufacturing cost and customer usage function is retained, however the trade-off of less sealing performance make this type of design suitable for general flavour of seasoning powder, and bulk purchasing, in which the frequency of usage is high. This shows the suitability of food service rather than household application.

Glass or plastic container with spice lid

The design of container with spice lid has also been common in the market. There are tow main lid designs that can be seen. First is the pop-up lid with inner control orifice, and the second is the rotation corking for amount control.

From the observation, this type of lid design has advantage directly for the end customer in the way that the desire amount to be used each time can be controlled precisely. The design comes with the trade-off of both manufacturing cost and seal function performance.

It can be seen that this specific type of lid most suits the powder ingredient or spice in which it would be used in small and precise quantity. Moreover with such small quantity use, it results in longer period of maintaining, thus the seasoning powder characteristic to be used under this packaging design should have characteristic of low humidity absorption due to low performance of sealing and resealing.

Summary of existing seasoning package function performance

From the analysis of available seasoning powder package in the market, the author has divided the package function performance into two categories, the manufacturer beneficial and user beneficial.

The manufacturer beneficial can be broken down to three performance items. First the design cost, which involves the application of innovation, and set-up of manufacturing process. Second the production cost, which involves the material and process complexity. Third the logistic cost, which involves the transportation, retail shelf space, and shelf life.

In the aspect of the user beneficial, it can also be broken down into another three performance items. First is the storage handling. This refers to the ease of safekeeping of the product away from the humidity, or in the other word the seal performance. The second performance item is the usage handling. This refers to the ease of getting the seasoning powder off the container with minimum effort and time. The third performance

item is the dispensing performance. This refers to the consistency and accuracy of the seasoning powder dispensing.

3.2 Primary Data Research: Understanding Customer Need

From the survey of the available packaging in the market as the secondary data, the idea of introducing new packaging must addresses the need of customer in the area that has not been proposed by current offer. This can be done through the primary market research.

There are many methodology of market primary data collection, such as the questionnaire survey, personal interview, and focus group. Each of the method is suitable for different type of primary data collection requirement.

3.2.1 Questionnaire Survey

The questionnaire survey is the first tool to be used to extract the primary data from the customer group. However, responding to the paper based question limits the personal interaction, which leads to the shortcoming on the open-end type of question. Thus this type of data collection is only suitable for the quantitative analysis rather than the qualitative analysis. In the other word, if the nature of the problem is related to the magnitude or scale of the information, questionnaire is appropriate and simple to employ (Lawrence, 2012). However with this case, the customer perspective and perception towards the seasoning powder packaging is the main subject to generate the new area of ideal packaging, thus magnitude and scale remains irrelevant (Lawrence, 2012).

3.2.2 In-depth personal Interview

According to the academic literature, this type of interview gives the “insight” (Lawrence, 2012) of understanding of the subject’s need or problem. This is achieved through a loose structure approach to interact and gain “insight”.

As one of the “Exploratory Research” Method, the personal interview, therefore considered to be “In-depth”, which suits at certain level to the need of addressing the problem regarding to the use of current seasoning powder packaging.

However, there are downsides of this type of “Exploratory Research”. First is that the interviewer is required to be consistent with the dialogue to secure the consistent respond of subject. Moreover, with the interview session limited time due to the constraint of sudden calling of subject. Therefore, the process of constructing the interview with adequate sample number will be time consuming. Another important downside is that the two-way communication will tend to generate bias more easily.

Lastly, the most important downside of the personal interview, in regarding to this case is that, the dialogue of discussion is unlikely to lead to the constructive “idea generating”, since it lacks the interaction for wider perspective.

3.2.3 Brainstorming

This type of qualitative research focuses on the idea generation, which is suitable for the initial stage of research (Nigel King, 2010). However considering the case of designing a new seasoning powder packaging, the subject of discussion is interested in the problems of usage, not the idea of how can the design can be improved. In the other ward, the author required some structured towards the discussion, thus a free idea provided by brainstorming process is not fully suitable.

3.2.4 Nominal group

Nominal group research focuses on the individual idea generation. The term grouping is only refers to the classification of participant type, the actual interaction of the participant in a group is limited (Nigel King, 2010). Thus, this type of research is highly potential in term of the idea generation without group bias.

Moreover in the researcher point of view, the interview is highly structure, and the communication is done on individual participant at a time in manageable session, therefore the research could evolve the structure to explore new idea in controllable manner.

However, as for the downside of this technique, each of the individual participants would be limited to his/her own idea causing the discretion, which in turn limit his/her perspective on the focus subject.

Interviewer or researcher could remedy this downside by restructuring the question or interaction, however this could dominate the idea of each and all participant by the researcher or interviewer perception of the respond.

In conclusion, the nominal grouping technique holds benefits of the effectiveness of idea generation (Ke de Ruyter, 1996), but employing this technique alone will not be adequate to generate idea of product to the required breadth. For instance, the employment of this technique alone on the seasoning powder package design idea would be limited to only one usage condition of each individual participant, which is not ideal for the finding in different aspect of usage by others.

3.2.5 Focus Group

Another “Exploratory Research” method similarly to the personal interview, however with the nature of a proper time length and number of attendees in the focus group session, the amount of emotional respond and discussion could lead to the perspective in which the maker or provider of the topic may have not been explored. Moreover, with the actual interaction and respond of each attendee in the group, each individual is more freely to express the idea and gesture according to his/her perceived understanding, as well as expressing the magnitude of respond, which can be an imply for the expectation of product (Jeffrey Durgee, 1987).

From the benefit of the focus group research method, it is suitable for an idea generation according to the academic literature (Lawrence Silver, 2013). Therefore, this method is the most suitable for the initial information-gathering tool for designing the new seasoning packaging.

3.3 Focus Group research variation

There are many variations regarding to the method of setting up the focus group research. The variation on the group size, the level of question structure, the length of session, the number of session, and the medium of discussion are all differentiate the aspect of the result finding. In the other word, different combination of the variation was practiced to yield the different result.

3.3.1 Traditional method

The traditional employs a two hours session, with 8 to 12 participants, and 1 moderator (Lawrence Silver, 2013). This set-up gives an opportunity for the conversation to develop into wide breadth of information due to a large number of participants. Moreover, since the interview would be held face-to-face, the emotional reaction can be observed on

each individual facial expression, and posture. Thus it is informative even the question of discussion is to be directed to other member.

However, there are concern points such as a group bias, moderator bias, and the lack of concentration. Some discussion in academic literature (Ko de Ruyter, 1996), review and found group bias is more than individual study. Moreover, the dialogue of the moderator as well as how moderator react differently from participant to participant is also unavoidable, thus causing a higher tendency for the discussion to be dominated (Lawrence Silver, 2013), especially if the moderator is involve in product or service itself.

Another concern point is on the structure of the discussion session. Since there is only one long session for the traditional focus group, the discussion flow may be considered less structured due to the large number of participants, thus the result finding would explore new area of interest but may or may not be relevant to the concern depending on the moderator, which need to lead the session discussion in structural manner. Moreover, the discussion is hardly conclusive due to the unstructured nature, which is difficult to tell the point where there is enough information gather.

Therefore, in conclusion regarding to the traditional focus group methodology, the trade-off of research is largely depending on the moderator. The moderator who is not directly involve with product and service will lead session in unbiased manner, however lacking the control over structure of discussion. In the other hand, with some involvement to product and service, the moderator with structured mind would hold ability to lead discussion and identify when the scope is reached, but higher risk of biasing the group (Jenkins, 1990).

3.3.2 Quads Focus group

Varied from the traditional methodology, quads group break research into two sessions, with four participants in one group (Lawrence Silver, 2013).

The main benefit of quads group comparing to the traditional is in three ways. Firstly, increases participant attention, due to smaller group. Secondly, it lessens the tendency of group norm domination, which is also due to the smaller participant number. Lastly, it allows the moderator and/or other involving person to evaluate in some degree of the hypothesis between each session, and allow fine-tuning for the next session, thus giving benefits in both structural control and participant input, while retaining the breadth from the total number of accumulated.

3.3.3 Two-way & Three-way Focus Group

This type of focus group research also breakdown into many sessions, the finding of the previous session is carry-over in the most original dialogue as possible; to the next session for the participant of the next group's discussion. This method is particularly useful to pass-on the perspective for the other participant in the next group, thus more chance to explore the idea collectively.

For the downside of this method, it directly increases the chance of bias as well as effectiveness in extracting ideas. This is due to the collective amount of information, in which it could obscure the cognitive of next group participant, thus lead to the possibility of the lack of originality.

The main application of this method is therefore suitable only for the exploration of perspective and idea from the different type of participant group, in which the researcher has structured the separate group of participant based on his/her position

towards the subject discussion. This way, the researcher could treat the carry-over information as an input, not only the perspective on the same question.

3.3.4 Internet focus group

As stated by the name, this type of research is done through the Internet or online-based system. The example could be the forum discussion, web board, or chat based software.

This type of research is beneficial in term of cost and time, which leads to more number of participants available for the research. Moreover for the case of initial finding of the usage, and idea of packaging, the number of input can be useful for generating hypothesis of ideal design function.

As for the down side of this research method, the emotional reaction such as the posture, gesture, and facial respond are not presented. Thus, the research to explore the participant reaction towards the problem or the magnitude of emotional respond will not be possible.

In the packaging design context, there are aspects of design that directly stimulate customer perception of quality, which lead to the purchase decision. The aspect such as shape, colours, and graphic of package design element stimulate the perception of quality in taste. Therefore, to conduct the research regarding to shape, colours, and graphic of the package through the Internet focus group will not yield exploratory result since the emotional respond cannot be observed.

However in this research, the scope is on the functional aspect of the package. The main concern is on how the customer uses the packaging starting from purchase

through to finishing off of the product. Therefore, the main concern is the problem that arises through the process, in which the magnitude of emotional respond is not as essential as other design aspect. Therefore, it is possible to carry out the Internet based focus group session for the new seasoning package function design.

3.4 Set-up of focus group: Function of Seasoning Powder Package research

As the scope of the seasoning powder package design in this case is to realised the design that solve the usage and keep-safe of the content, therefore the information that is required to be explored is on the process of buying, using, and keeping operation of the product.

In academic theory regarding to the understanding of the customer behavior and interacting to the product, “Ethnography” is the concept that must be used as a guide to understand the customer mind of like or dislike in a specific product. The factors that lead to the sense of like or dislike must be explored through the systematic interview of the product usage problem along with the information of how the customer in different culture or background copes with the problem (Howard, 2009).

3.4.1 Choosing Participant, group size, and number of sessions

First parameter for the focus group that needed to be addressed is related to the grouping and type of the participant, who is the key person for the information to be explored.

According to the marketing target of new seasoning powder, which is the upper market segment. The obvious market would be the new family that starts cooking at home. Therefore, the target participant would be a group that is fairly young age, who cooks for him/herself, or for family. The age range will be between 27 and 35 both male and

female. Apart from the age group, the variety in the participant culture background is also required, since the wide range of problem can be presented. This cultural background includes, professions, position in the family, family size, and type of residence.

Moreover, the critical requirement of the participant is the person who cooks at home in regular basis, as well as using the seasoning powder of various types. This requirement is essential since the focus group will choose representative for information and solution, known as lead user method (Nadia Bhuiyan, 2001)

Apart from the regular usage of seasoning powder, the characteristic quality of the participants to be included in this research is based on the marital status. This is largely due to the typography of difference in life style and obligation, which induce different category of concern. Moreover, this life style concern of the participant is also separated by the gender.

Another criterion of choosing the participant that has been mentioned earlier would be the participant profession. Considering there is a wide range of profession, in which the personality norm of each profession holds its own method of thinking as well as the approach of problem solution both for work and everyday life. Thus it is ideal for the group to comprise of various kind of profession. However, with the limitation in analysis capability of such a wide range of difference, the representative of each kind of profession is to be chosen based on the level of specialty of the profession, an the ability to manage the personal time. Therefore, the participant will also be chosen to cover all four quadrants of these two criteria regarding to the profession representation.

As for the number of participant in a focus group session, the author will employ the quad group to increase the level of participation as well as eliminating the chance of group bias. In contrast, with the group size of 8 to 12, there will be tendency of the discussion that is build-up upon one another usage experience, thus the discussion of one person idea may shows the image of how one react to other's problem rather than based truly on her his/her own experience.

Another substantial benefit from the quad group approach is regarding to the structuring of the discussion. To explore the problem of usage through the customer experience, the author seeks to explore and understand the difference in cooking culture of a group of customer. Considering the difference background of the family, each individual has approach in cooking differently, including the style of dish, characteristic of ingredient, process, thus the ethnographic study approach is to be taken. (Howard R. Moskowitz, Packaging research in food product design and development, 2009). With a larger group approach, the structure of discussion would lack responsiveness in anticipating each type of the culture, thus the smaller group but more number of sessions is beneficial for the author to build the rough category of usage from the first session and develop the question and discussion topic in adaptive manner to the later.

3.5 New Seasoning Package concept planning

After the focus group information gathering, the requirement in term of usage has been collected. However, on the design planning stage, it is essential to make sure that the design can be deployed and fit in all aspect, not only best for customer usage. The other aspect that has effects on the successes of design deployment are for example the market attractiveness of the design, and the capability of production of the design.

To translate all requirements to the final design, the tool that ensures the transition is the "Quality function Deployment (QFD)". In this section 3, the author will employ the QFD phase 1.

3.6 Design Requirement

In order to correctly propose the concept to suits the usage condition, the performances of various functions must be considered. The engineering function therefore can be listed.

3.7 Package Function Innovation

According to the “Theory of Inventive Problem solving” (Gadd Karen, 2011), every solution invention has been invented. Thus the importance lies on the actual employing of the invention to realise the commercial value.

In this context of the seasoning powder package design, there is no exception from the concept. The argument for the concept to be true is from the fact that the type of the package is still limited as a fast moving consumer type of product in which there is high limitation in term of cost, where a new material or a ground-up development of the package function cannot be returned through the volume sales.

Therefore, the approach for concept generation is to select and apply the existed design element mechanism to answer the customer requirement. In the other word, an innovative design approach.

Realising the approach for desire function from the existing innovation is therefore the best approach. The source of design inspiration is therefore considered in two ends, the first being the customer end, where the focus group has provided the essential information. The second source would be from the existing package element, which is potential in serving the specific need. The process is therefore the matching of the existing package design element to incorporate to the new package and evaluating the best possible design.

Following the knowledge funnel concept (Roger Martin, 2010), the author employed the benchmark of existing package and creates concepts of potential design to answer the customer need.

3.8 From voice of customer to design performances

In order to correctly propose the concept to suits the usage condition, the performances of various functions must be considered.

3.9 Package Concept generation

Once the ideal packaging requirement that has been constructed according to focus group information, manufacturer's market strategy, and the capability of production, the concepts of the seasoning package can be generated.

With the source of inspiration from actual usage and the everyday-used package from other type of product, numbers of concepts that hold the design element to satisfy the characteristic requirement must be considered as many as possible.

3.10 Design concept assessment

From the concept generation, each of the concepts has different advantages and disadvantage to various aspects. The assessment procedure is therefore essential for select the most viable innovation concept for further process of design development.

From the author point of view, the best design concept is the concept that matches both manufacturer and customer requirement as close as possible. Therefore design concepts will be evaluated against the initial marketing requirement. In the other word

how a specific design aligns with the targeted customer, intended marketing target, expected operation.

3.10.1 Customer-end value analysis

First and foremost, the assessment process to select the design concept against the customer requirement, in which the target is the design concept that at most represent the solution for the customer. The procedure of judgement is based on the use of the evaluation matrix and also employing of Pugh Matrix concept, in which each design concept are ranked from 1 as the least quality to 6 as the most quality on each concern criteria. The concern criteria are also weighted differently according to the focus group analysis, and the requirement breakdown.

3.10.2 Marketing-end value analysis

According to the article by Jay E. published in Harvard Business review (Klompmaker, 1976), there are many dimensions in term of marketability that the manufacturer requires to evaluate before making the go or no-go decision. Therefore, apart from the performance of each concept to be ranked for comparison, the performance must exceed the minimum requirement or the limitation that obstruct the manufacturer from delivering the product.

With this in mind, the meeting with the food section project manager of Chemmin Corporation was arranged consecutively along the research timing. The target of meeting is to discuss over the benefits in term of each design concept to the marketing purpose as well as the manufacture ability of each design concept.

For the internal clarification for marketing, and operation limitation, food section project manager, who has experience in managing the launch of the Package snack prior to

moving to Chemmin Corporation, and responsible for the launching of dry noodle product line as well as the Potato starch. The experience in launching of the new products has also involve the dealing with packaging supplier for both outsource and purchasing of the small filling / sealing machine for in-house trial.

Through the experience of package food product, the project manager has been taken as the source of the information from manufacturer side in both marketing aspect and manufacturing aspect.

Package concepts performance on marketing mix

From manufacturer side, the first main aspect to be used as criteria in deciding on the packaging is the marketability of the design concept to be deployed.

To test the performance of each concept design against the set marketing mix (Baker, Hart, 2011), the criteria has been set by broken down the requirement of the packaging role in each of the 4P's, which is the pricing, place, promotion, and product.

Note that the role of packaging in term of product has been analysed under the customer usage suitability. Thus the main focus for interview will be done of the role of price, promotion, and place.

Package concepts performance on competitiveness

Another aspect to be assessed among the different package design concept is the ability of the design to survive and compete in the competitive environment.

With this assessment, Porter's 5 forces analysis is conducted before the comparison and ranking of each concept (Marburger, 2012).

3.10.3 Operation-end value analysis

In this feasibility the tool to be used for breaking down the internal capability is called "TELOS" developed for Accounting System analysis by James Hall (James A Hall, 2007), which classified the aspect of feasibility into 5 groups, technological, economical, legal, operation, and schedule. Therefore, each design concept will be reviewed and compared regarding on each aspect.

3.11 Component Design Development

Once the concept that holds the optimal value across the manufacturer and the customer aspects has been assessed, the development therefore requires to be done to ensure the feasibility of the introduction of the new package design.

The tool that will be used for designing and reviewing is the failure mode and effects analysis (FMEA). The main benefit from employing the FMEA in the design context is to identify and remedy the potential failure that could be put forward to customer (Anil Mital, 2014).

Moreover, focusing in the design development stage, the design specification must be thoroughly balanced for both customer and manufacturing aspect. (Dyadem, 2004). Therefore, the potential trade-off which holding either the manufacturer side or the customer side will be identified, analyses, and adjusted to make design counter measure.

After all the potential failure mode has been identified and corrected by the design counter measure on each design element, the final design specification requirement can then be set.

3.12 Component Design Review & Final Design

The last stage of this section is the “design review” (Anil Mital, 2004), in which the design characteristic in term of functionality, suitability, and estimated feasibility has done with different field of expert (Gianfranco Zaccai, 1994). The expert of packaging individual as a manufacturing side, the project manager as an expert in marketing side, and the author as a representative from the customer suitability side.

Chapter 4: Analysis of result

4.1 Set up of focus group

4.1.1 Participant profile

From the specified participant characteristic, eight participants were raised, the following Table 3, Figure 11, and Figure 12 shows the participants characteristic regarding to the research requirement.

Table 3: Focus group participant profile

Alias	Focus Group	Gender	Age	Profession	Marital Status	Family Size	Residence
A	1	Male	32	Physician	Single	5	House & Apartment
B		Female	30	Programmer	Single	5	House & Apartment
C		Female	33	House Wife	Married	2	House
D		Female	31	Staff/Employee	Married	2	House
E	2	Female	29	Sales/Marketing	Married / Children	3	House
F		Female	33	Self Employed	Married / Children	3	House
G		Female	32	Staff/Employee	Married	4	House & Apartment
H		Male	28	Engineer	Married	3	House & Apartment

From Table 3, it can be seen that all eight participant selected for the focus group research covers the range of concern aspects in term of age, profession, marital status, family size, and type of residence.

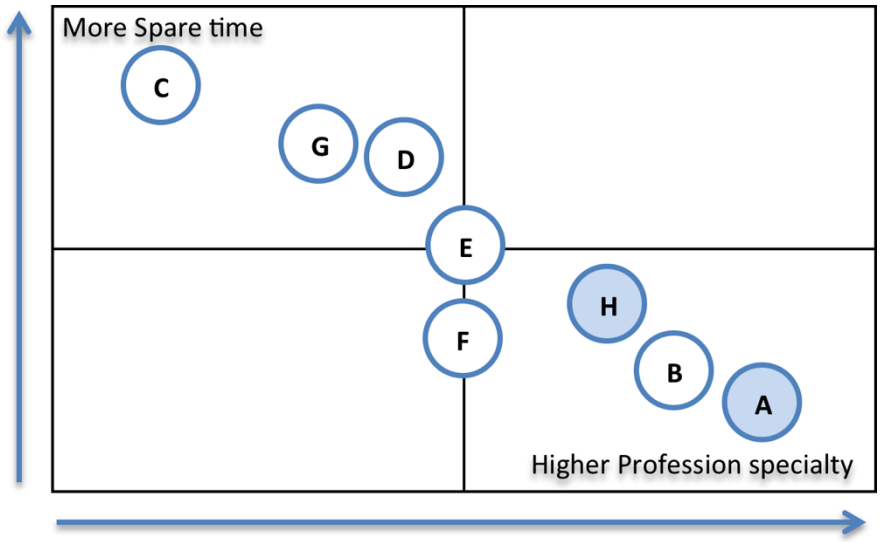


Figure 11: Participant spare time VS. Profession Specialty

On Figure 11, focusing on the target profession to be researched through focus group, the representation of the profession, which holds effect on the interaction of the product, is in two ways. First is the amount of free time, which implies the level of importance, given on life style, and second is the specialty, which implies the different approach on the solution.

Recognising the direct relation of available time and level of profession specialty, the choice of participant has been done across the different profession regarding to the concern aspects, which has been structured to extract the personal usage, problem recognition, and solution carried out by different approach.

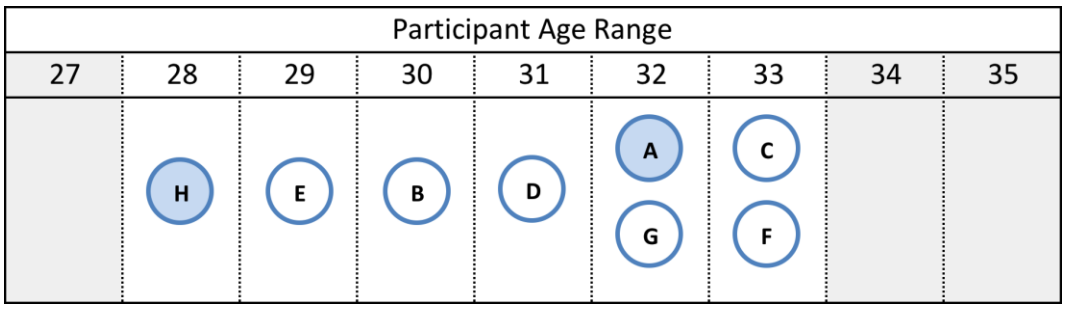


Figure 12: Age distribution of selected Participants

Regarding to the age group distribution, the target age of participant has been selected ranged from 28 to 33, which is directly coherent to the target customer group.

Moreover, considering the marital status in Table 5 and the age distribution in Figure 12, there is adequate coverage of different type of marital status and age to provide the representation of difference life style and role towards the usage of seasoning powder under the home-use environment.

4.1.2 Focus group discussion structure

The main concern of the operation involves between customer and the seasoning powder package must be explored. In this case, all of the involvement between the selected group of customer and the product packaging is to be explored. In the other word the interaction of the customer to the packaging will be explored from the first stage of buying to the last process of the after consumption where the product will be disposed.

Therefore, conceptually, the main role of package is considered to be the mean to carry out the service of holding and keeping safe of food content for the customer need every time it is needed. Similarly to the evaluation of any service type of system performance,

the tool that the author has chosen to employ in structuring of the discussion is the "Customer journey mapping" (Liedtka, 2014).

Table 4: Customer journey mapping for seasoning powder usage

Journey / Respond	Go to shop	Select product	Bring back home	Storage	First use	Storage	Use again	Dispose
Good Impression	- Close to home	- New / Value - Many choices	- Easy to cary - Small compact	- Sip in place - Little space	- Difficult to break seal & pour	- Seal tight quickly after use	- Reopen easily - Pour out easy as first time	- Can be recycle - Take little space
Bad Impression	- Far away	- Not interesting - Too expensive	- Big shoping bag - Diificult to grab	- Waste of Space - Don't fit in place	- Easy open - Pour easily as needed	- No seal use clip or rubber band, takes time	- Take time unwrap - Caked	- Can not recycle - Bulky

With the "Customer Journey Mapping" shown in Table 4, the aspect of the packaging which effects the customer usage has been reviewed in order to raise the discussion point regarding to each steps of interaction.

First interaction of the customer to the product occurs during buying process. Starting from the picking-up of the product in the shop, to transporting it to home, the exploratory information that is to be extracted are the frequency of buying, the prefer brand, or other alternative product and circumstances in making decision. Other information can be the transportation of the product; the discussion could be on the problem related to the carrying bag, location of the shop, and how customer travels to the shop and back.

The following process is related to the storage and keeps safe, in which the process taken place at customer home. The problem of shelving space, shelving place, storage duration before use, and other storage handling problem faced by the customer.

Next is the discussion in the process of actual using of the product package. The problem occurring points to be focus includes the process of seeing of the package, reaching, and unseal of the package upon the first use. Moreover, the most important process is the problem of reopening for content after the first use, the method of getting

the content out, and the safe keeping of the package. This process will be put into focus in the aspect of the problem found by each individual customer and how each individual solve or come-up with the solution to the problem. Other auxiliary information regarding to this aspect may include the amount of seasoning powder usage each time, type of dish where the seasoning powder is used, and the sequencing of the usage.

The last process of the customer interaction with the product packaging that needed to be explored is related to the trashing of the packaging. The main focus of the trashing process is how customer gets the last of the content out, and taking care of the rubbish.

4.1.3 Choosing the medium for research

In the view of the use of medium, there are two aspects to be considered. The first aspect is on the person who conducts the focus group, or in the other word, the moderator. The second aspect is the mean of conducting the focus group; example includes the conventional meeting organising or the Internet forum chat room as a medium.

For the first aspect, there is a choice of the author to conduct the focus group by self; another choice is to conduct through another third person. As the “out-of-house” approach, which employs the third party moderator has been reported to be less bias due to a level of detachment (Jenkins, 1990). The main concern that the in-house moderator would be bias or dominate the session in this particular case is related to the moderator’s preconception of how a seasoning powder package is being used. Moreover, the moderator who is involves or experience in the seasoning powder package design concept would likely to be a dominator in the session (Erhard K. Valentin, 1994).

Therefore, either the choice of conducting the session with “in-house” or “Out-of-house” moderator, the most important factor to prevents the domination of the focus group session from the moderator is to choose the moderator who is free from the experience in designing or the familiarity of product usage.

The second aspect of the medium is the facility in conducting the focus group. There are two main approaches in facilitating the focus group session. One is the conventional set-up of meeting and the later one is the focus group based on the Internet as a medium. As mentioned in section 7.3.4., regarding to the approach of the Internet focus group session, this specific case of the subjected exploratory research is less involve with the emotional quality part of the product. Instead, the information of experience and participant problem solution is focused. Thus Internet chat forum or any kind of chat platform will be adequate for the initial idea generation.

4.1.4 Summary of focus group research approach

To sum up the best approach in conducting the exploratory research on the usage of seasoning powder packaging of Thai customer, 2 to 5 quad focus groups with a structured discuss lead in accordance to the stages of product interaction has been set. The medium of session is based on Internet chat application. As for the discussion moderation, the person who is inexperience with using the product and the also the limited experience in the design is preferable regardless of being in-house or out-of-house.

4.2 Focus group sessions result

There are two sessions and total participants of 8 participants on the focus group. The result of each group’s chat and how the author has adapted the structure of discussion will be explained and analysed in the following section.

4.2.1 Result of 1st focus group

The first focus group comprises of 1 male, 3 female ages 32, 30, 33, and 31 accordingly. For this context the author will state the participant as Participant A to participant D accordingly.

Group 1 Background

Starting from the question regarding to the background of the group, the occupation and status has been discussed among the participants. Two of the participants (B & D) are employed; Participant A is currently studying abroad in Medical field, and lastly participant C is currently a fulltime housewife.

On the overall information regarding to the meal preparation and consumption, all participants had more or less cooking experience. However, each individual has diverse method and preferred dish. Participant A is concern more on the speed of preparation and health particularly concern the type of ingredient used. Steak & Salad is of main interest with the minimum uses of seasoning product to salt and pepper and other dressing source. The other female participant B, C, and D responded to the question as well as the discussion on participant A. The discussion developed into a recipe sharing of the meat marinate and dressing preparation, in which Participant B and C were the main contributors on the topic. The author as a moderator has moved to participant D about the type of dish cooked and consumption. Participant D cook less frequent, however with large quantity for containment. The usage of seasoning ingredient is as normal with a bulk buy of overall ingredient.

Purchasing Decision

Moving on the discussion to the intended structure, the discussion about the criteria in choosing of the seasoning product was raised. Anyhow, the author has not strictly made question for discussion only on the seasoning powder, the comment on other product relating to the cookery also discussed.

The main learning point of this discussion topic is that, most participants came to the same agreement was that the buying process of the ingredient is made in bulk at the whole seller or retailer shop. The main concern is on the cost of the ingredient, for example of discussion includes the purchase decision of vegetable oil, sugar, and fix type of the seasoning powder is all based on price comparison. However, in additional to the price as the main criteria of the purchase decision, the familiarity of the brand is equally important. Example raised by Participant C regarding to the choice of purchasing a particular brand of fish sauce, in which the criteria of the brand rules over the criteria of the price. In contrast, the participant A has a diverse choice of purchase, which is based towards quality and how it will be used.

On the more direct discussion leading towards the seasoning powder, the choice of seasoning powder purchase depends largely on the flavour and the dish that it will be cooked into. A particular brand of the Seasoning powder, were mentioned along with the type of dish that it could be cooked into. Among the group, each individual has experience living abroad, thus a positive rating against particular this brand.

The buying pattern for this type of seasoning powder is mentioned to be as a standby when there is no idea to cook, which most participants agreed that it is less frequent in buying this brand's or specific type of the seasoning powder.

The more standard seasoning powder is frequently purchased by participant C, and participant D, in which the brand that has been used by family is carried-over and continue being purchased since the price in the market do not differ significantly between each brand. The more standard flavour such as pork, or chicken, flavour were bought a 3 to 4 sachet at a time depending on family size.

The pick-up location or the shop is mostly whole seller, which is closest to the participant house. However, in case of participant A and B, who lives in apartment, the convenient store is more practical to purchase seasoning.

Storage Handling

On the discussion subjecting the storage of the seasoning ingredient after the first buy. All participants confirmed the storage of any seasoning powder in cupboard either overhead or drawer type storage. The cupboard is usually dedicated for dry ingredient storage.

Leading the discussion to the problem about the storage, the author urged the respond first from participant D for the first discuss. Participant D shared concern about the dedicated cupboard for dry ingredient. The concern is that the seasoning powder is usually bought with the sachet package, and stored by insert on the sidewall of the cupboard as usual. If more than one sachet is bought as for usual bulk buy, the package could be lying flat on the deck and could not be seen and reach conveniently.

Another problem mentioned regarding to the storage is with a specific cupboard type. Some cupboard design is with suspended metal grille or basket, in which the sachet type of product is mentioned to have slipped and fall. This problem can be overcome easily by lay package flat, however it uses up storage space. Not only the sachet type of

seasoning, the bottle type of package also faces the same problem, where some suspended metal grille causes bottle package knocked over to easily. For the solution that has been carried out by the participant, any storage on the suspended grille is avoided.

Actual Usage

Continuing on the structured discussion. The discussion was lead to the actual usage of the packaging. The question directed first to Participant C regarding to the usage process of the Seasoning powder while cooking. The respond is on the standard flavour (pork) sachet type seasoning powder, which it has been used mainly when making dressing or sauce, and stir-fry. Tearing open of the sachet or pouring the content out has never been a problem. However, once the sachet is torn open, the elastic band is used to tightly seal the sachet. Moreover, if the package is not being sealed away from humidity, the caking will cause difficulty in pouring the content on the next use.

In additional to participant C comment, participant B has shared the solution for resealing problem. As participant B also uses the same type of seasoning powder packaging, the solution is to lightly seal with the plastic clip and store in the refrigerator. Other such as participant C made further comment that it is cumbersome having to remove the elastic band before use. Moreover, the shape of package after wrapped tight with elastic band would not slip the same place in the cupboard space, therefore after the first use; the package is either left around the cooking area or in the refrigerator.

On the subject of the alternative packaging, the author raises the question about the usage of alternative type of seasoning power. Example were given includes the spice bottle type. The participant responded positively to the usage of plastic bottle with spice lid, the aspect of cleanliness, quick, and easy to use. However, some down side were

mentioned including the small that current spice lid on pepper bottle allows too small of the quantity of the content being poured out. Moreover, with other content apart from pepper powder, such as seen the bottle used for Parmesan cheese product, in which the powder content always caked from moisture and require shake and tab heavily before every use.

Package Disposal

Moving to the last process of the interaction between customer and the seasoning powder packaging, the last process that is structured for discussion is the trashing of the package after use.

The author raised the question about how the participant manages the kitchen garbage. The respond were various in between each participant. Some such as participant A do not have problem since there is less kitchen garbage and the garbage is taken out regularly. Other participant who lives in a house added comment on the problem of bulky garbage such as bottle or plastic container, however the problem is minor since the kitchen garbage is being taken out daily.

As in the aspect of the recycling, some participants separate the plastic and glass garbage for resell. Participant A, and B do not separate garbage since small quantity.

4.2.2 Learning point of 1st focus group

From the process of buying, the brand loyalty has large influence on the purchasing; meanwhile the price criterion is to be kept competitive, since there is expected price range on the specific type of seasoning powder product. In additional, the bulk-buy of the sachet type of seasoning powder is ideal, however the sachet type storage, seal, and reseal process is one of the obvious issue according to the discussion.

4.2.3 Result of 2nd focus group

Group 2 Background

For the second session of the focus group, the participant E through H age is 29, 33, 32, and 28 accordingly. This group participant characteristic is also focus on married status to explore the usage under family set-up comparing to the first group, where two of the participants are single. Moreover, the introduction of this group participant will also represent the new family that has children in the family to explore the problem or expectation on the product.

Anyhow, the structure of the discussion will follow the previous group structure, which is the stage of interaction with the product package.

Purchasing Decision

The purchasing decision question has been directed first to Participant E regarding to the preferred brand and the place of purchasing. The respond of the question were first mentioned about the type of dish that is usually cooked at home, which is the stir-fry, and the specific brand was mentioned out of the familiarity of establishment. Moreover, the purchasing is usually done at a large grocery retail store together with the family on weekly basis. The quantity that is being purchased usually not in bulk since the family is usually goes for grocery shop not longer than every two weeks, therefore only one or two sachets are being bought at a time.

With the same question, the author has directed and asked for the opinion from the participant F, in which participant F is with same marital status and also with a child.

The respond of Participant F is at some certain level differing from Participant E. The place that is usually preferred for purchased is at fresh market near the participant home. Participant F also emphasise the value of the seasoning powder over the brand. Moreover herself does the buying decision since participant F shop for grocery alone.

As for participant G, only a few occasion that she bought the seasoning powder, since the grocery has been done by the family most of the time at home.

As for participant H, who mostly lives at the apartment, the place of purchase is either at the convenient store at the apartment or the fresh market nearby. The quantity bought is as small as needed, since not frequent use.

Storage Handling

The second group manages storage of the seasoning powder similarly to the first group. As participant E and F live in a house, the space of the storage is as no problem. Both of the participant stores the sealed seasoning powder and other sauce in the cupboard. Other participant G stores the seasoning powder in the refrigerator, since it is the same place where the storage after the first use is done. In contrast, for participant H, the storage place is not fixed, but usually the sachet placed near kitchen top area for the easiest access while cook.

Actual Usage

Start with Participant H, where the seasoning powder or other seasoning sauce is placed directly on the kitchen top around the stove area. Participant H uses seasoning powder most of the time with fry-rice or stir-fry. By keeping the seasoning powder close at hand. The participant cooks taste better with less time, which is the main concern that participant H focuses.

Moreover, about the question of seal and resealing of the package in the next use, Participant H uses the close hanger clip to lightly seal the sachet by folding the torn corner a few times and clips it with the cloth hanger clip. Furthermore, there are other participants such as participant G, who raise the question regarding to the caking, in which when leaving the torn open sachet outside, the seasoning powder content will cake, unless tightly sealed with rubber band. However, the comment was not taken as a problem for participant H, since participant H comment that he always taps the caked sachet with the tabletop before reusing the seasoning powder.

In contrast to Participant H usage, participant G reseal the package by folding the sachet from the top down as far as possible, wrap around with the rubber band and store in the refrigerator. This way of safe keeping, participant H could prevent caking of the content for a convenience use.

Moving to the participant E, the usage is similar to first focus group, which is normal tear on the edge of the sachet and wrap sideway with an elastic band. The safe keeping after the first use is in the cupboard the same place of first storage. The usage of participant E coincides with the usage method of participant F, where the rubber band was used for the resealing after first use.

In additional from the observation, the author has observed that the method of tearing is mostly on the side corner of the sachet, therefore the question was directed to participant E about the reason for tearing only on the sideway.

The respond from participant E commented on the easy pouring for the next use. Moreover, participant H has added about the open portion being torn, that the width of

corner torn is aimed at around ¼ and not more than 1/2, which helps participant H manages the pouring amount while control the sealing by easily. Participant E responded to the additional comment from participant H positively.

Continuing with the first tearing method discussion, participant G also made comment that the amount of open is not of concern. The author then directed the question for participant G to clarify the usage. Participant G then responds regarding to the tear opening process. Usually participant G uses scissors to cut across the width of the sachet to remove the top completely off, in contrast with the other who either tear one corner diagonally or tear one side across some length and leave some portion attached. The reason was explained that the in doing this, the top part does not get in the way when use, moreover it will not tangle with the rubber band that wrapped in a scroll-like pattern.

As a moderator, further question were made directed to participant G regarding to the pouring of the content when use during cooking. With the case of tearing across the whole width of the sachet, participant G is still pouring the content sideway of the sachet, given that the open portion is wide enough to control using finger to block amount of the content to control the dispensing.

Following the respond of participant G, the author has directed the attention to participant F regarding to the pouring process. Participant F responded that the corner is being torn similarly to participant H, where the open portion is just enough in order to seal easily with elastic band. Upon the pouring, participant F sprinkle the content sideway from the open corner directly to the pan. Participant F also added that while cooking, she usually sprinkle around, and guess when it is enough by approximation of time she has been sprinkling the content. This approach has also been agreed to be the same from participant E and participant H.

Package Disposal

On the disposal of the package after use, respond was received first from participant E. Participant E makes disposal of kitchen daily, commenting that insect and animal in the house could be avoid avoided. Participant F also agreed with participant F however the garbage being taken out once a few days since less garbage from cooking.

Directing the question to participant G, this responded similarly. However, during stay at apartment on weekday, there is less about of garbage from less cooking. The garbage is mostly dry. Moreover with less insect and animal, the garbage is taken out once in 3 to 5 days.

Different respond regarding to the garbage disposal from participant F, where the garbage bag is first filled before it being taken out, thus the time between each disposal is varied.

4.3 Analysis of Focus group information

From the focus group information, the author has noticed the most distinct difference regarding to the overall interaction to the seasoning powder product is related to the difference in profession type of the participant. The summary of finding is shown in following Table 5.

Table 5: Participant profession and interaction with seasoning powder product

Stage of interaction / Profession Type	Purchasing	Storage Handling	Actual Usage	Disposal
Specialty + Less Time (Participant A, B, H)	- Percieve Quality - Conveniency	- Available Storge Space - Convenience of Reach	- Corner open & sprinkle - Clip or Rubber Band reseal - Store both outside and refrigerated	- No separation of garbage - No Concern on disposal
Balanced (Participant E, F)	- Selective - Value over brand	- Available Storage Space - No Concern	- Corner open & sprinkle - Side way elastic band wrap - Estimate amount by sprinkle	- No concern on the disposal
More time + Less Specialty (Participant C, G, D)	- Value - Bulk Buy - Loyalty/Familiarity	- Concern to store in dry place - Concern of used space	- Top portion slid with scissors - Tight rubber band + refrigerate - Estimate amount by blocking	- Garbage seperation for resale - Concern of bulkiness

From Table 5 summary, the learning point from the purchasing decision is that, there are 3 qualities that packaging must achieve directly or indirectly. The convenience of uses refers to the place of buying. Following by the selective requirement, this refers to the type of taste that suits customer need in selective manner. This in term of packaging will be the flexibility performance requires i.e. package must be robust enough for a quick change that may rise from market requirement. Lastly on the purchasing aspect, the value is still at certain level important to be considered in the design, in which the packaging holds a large portion of cost that could incur on the unit. Moreover, the size of the package likely effect the bulk buy decision, the overly bulky design will cause difficulty to buy in batch.

On the aspect of storage handling, dry and close at reach storage space is dedicated across the type of household. This reflects the requirement of the sealing performance (shelf life). Anyhow, the storage space is still under concern.

For the actual usage information, all participants face the problem of resealing the content away from humidity. Different solution has been carried out from one to another type of participant. The most common solution is to use the rubber band in which it cause additional operation of wrapping and wrapping as well as the relocating the storage to refrigerator in some case. Moreover, another learning point is the method of estimating the amount of content of each use, in which the most used method is by sprinkling the content from one side of the sachet with controlling of the open orifice. Another dispense controlling is by blocking the content by hand before sprinkle the content as a rough estimation.

The final interaction of the customer and seasoning powder product package is on the disposal. The learning point from focus group shows that the representative participant who has more time concerns on the bulkiness of the garbage as well as the type

separation for recycle. Other representation that lives in apartment or having less time has no special concern on the disposal of the package.

4.4 Summary of Customer Ideal package requirement

First information to be summarised to construct the QFD phased 1 is the customer requirement.

From the focus group result, the usage problem at each interaction stage can be broken down. Therefore the best and ideal usage experience of each stage can be identified.

4.4.1 Ideal Package for purchasing decision

On the purchasing stage interaction, through the focus group information, the customer would ideally need to be able to experience two touch points. First is to be satisfied in term of the range of choice. In term of marketing strategy, this would be the requirement of an unlimited variety of flavour for every dish. This directly reflects into the operational aspect of the requirement, in which the flexible operation to shift or mix among varied choice and volume would be at certain level required.

Considering the role of the ideal packaging to allow this specific quality, the package must allow the flexibility in volume, in the other word ideally smallest quantity content possible as a platform for market driven flexibility.

For the second touch point, this is the value of the product. In the purchasing stage, perceived value is from shapes, colours, and brand as well as price justification.

As the value in term of actual taste of the content has already been set above competitor, the expected role of package is to convey the value while keeping an acceptable unit cost, which allow adequate mark-up for the increased content material cost (higher material cost) and the introduction of new package function against the target whole sale price.

4.4.2 Ideal Package for Storage Handling

The information from the focus group indicated the need of storage in the available space, convenience of reach, and take-up space. However, considering the available space that is both dry and convenient to reach may not always be available. The role of ideal packaging will then requires to take-up minimum space with high sealing performance before first use, which allow robust store space. Moreover, the distinct visibility of the package from other object also important for the easy finding when needed.

4.4.3 Ideal Package for Actual Usage

According to the focus group discussion information, the most problematic interaction with the package that customer experience is during the actual usage.

After the first use of package, the need of folding the package, wrap with rubber band, or put the package in the refrigerator, can all be traced to the common problem cause of humidity, in which the trade-off between convenience and seal during is high.

The role of ideal packaging to be introduced must eliminate this trade-off while not shifting or disturbing the usage method. The usage method in this case is how customer sprinkle or pouring the content from a side of the seasoning powder sachet.

4.4.4 Ideal Package for suitable disposal

As the focus group information indicated, the only main problem that could present on the disposal stage of interaction is the bulkiness of the package, which takes-up the garbage bin space. Moreover, on the minor consideration of the recycling issue presented from the focus group, the package either fully recyclable without needing to remove or manually separate the assembly.

The ideal package therefore, should be able to either flat folded, or fully recyclable in case bulkiness design.

4.5 Design Requirement

From the review of the focus group result and the generation of the ideal package, the concern package function to be the target of design has been summarised as seen in Figure 13 below.

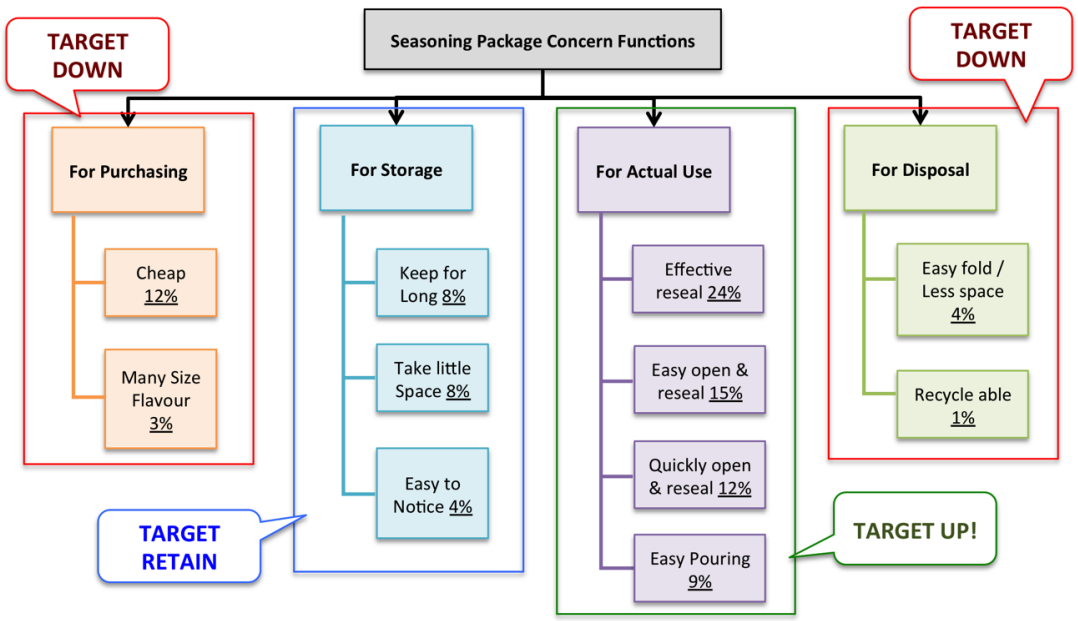


Figure 13: Seasoning Package Concern Function

As shown in Figure 13, the design concept must propose the solution according to the given customer requirement for later stage evaluation of various design concept's prospect (Richard ChristyMichael Wood, 1999).

With the concern emphasised on the actual usage aspect, the performance in this area is to be increased, while the aspect of storage is to be retained, and the purchasing aspect as well as disposal aspect is to be compromised.

4.6 Concepts Generation

From the target of design requirement, 6 concepts have been generated under the emphasis of the resealing and dispensing mechanism to increase the actual use performance, while the storage performance is to be retained by the employing of either the sachet or bottle shape.

4.6.1 Polypropylene bottle with Spice Lid

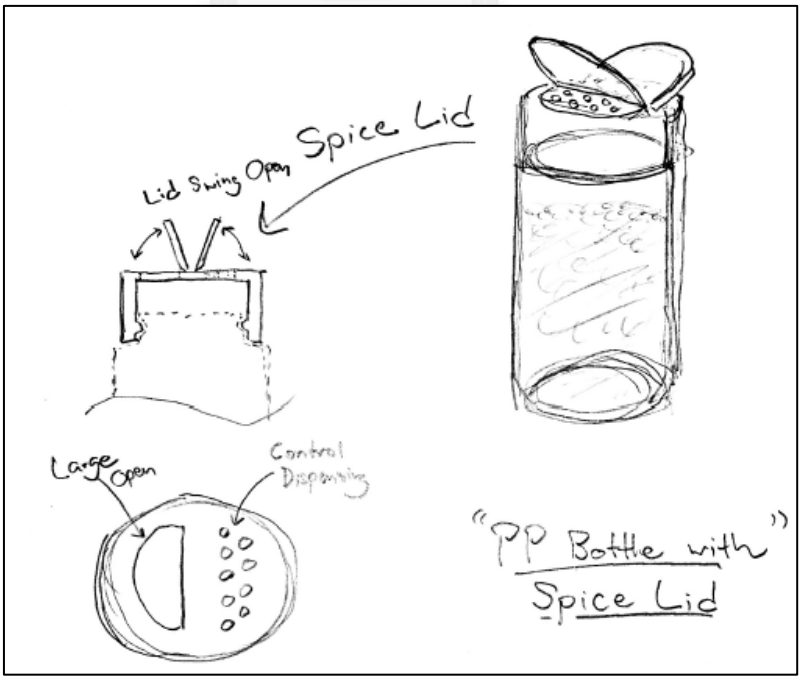


Figure 14: PP Bottle with Spice Lid Concept

As seen in Figure 14, the package design consists of two pieces, first is the lid with two sides pop-up, the second part is the bottle container.

Considering the design element that has been employed for the seasoning product especially for spice, the most important design element function is of the plastic spice lid that matches the requirement of speed, seal and reseal. Moreover the stand ability of the bottle gives good visibility, thus more reach and grabbing performance.

In term of the shelf life, the Polypropylene (PP) bottle is at some level oxygen and moisture permeable, thus with the top lid aluminium foil seal, the shelf life is maximum one year. The glass bottle will extend the shelve life however with the added cost. The cost quoted for the Polypropylene (PP) with a spice lid is at 7.5 to 9.5 for total package outsourced.

On the limitation on this specific design, the size flexibility is limited by the shelf height and the lid design diameter, since the main marketing channel is through the wholesaler and distributer. The range of content being proposed to the market start from 30 gram to 500 grams, in which the proposed design with the diameter around 50mm to 80mm would require the container height to provide maximum containment of 150 grams size. The more variability of unit selling size more than 150 grams require larger lid diameter.

4.6.2 Polypropylene cantilever rotation dispenser

Another design concept that has the potential on providing value in term of the dispensing of the powder content is the plastic cantilever spring design.

The particular design element has been successfully employed by a candy type of product i.e. Smint by ChupaChups. The plastic levering provides a spring preload to close the opening orifice as well as returning force to close the open orifice after sprinkle or pouring the content.

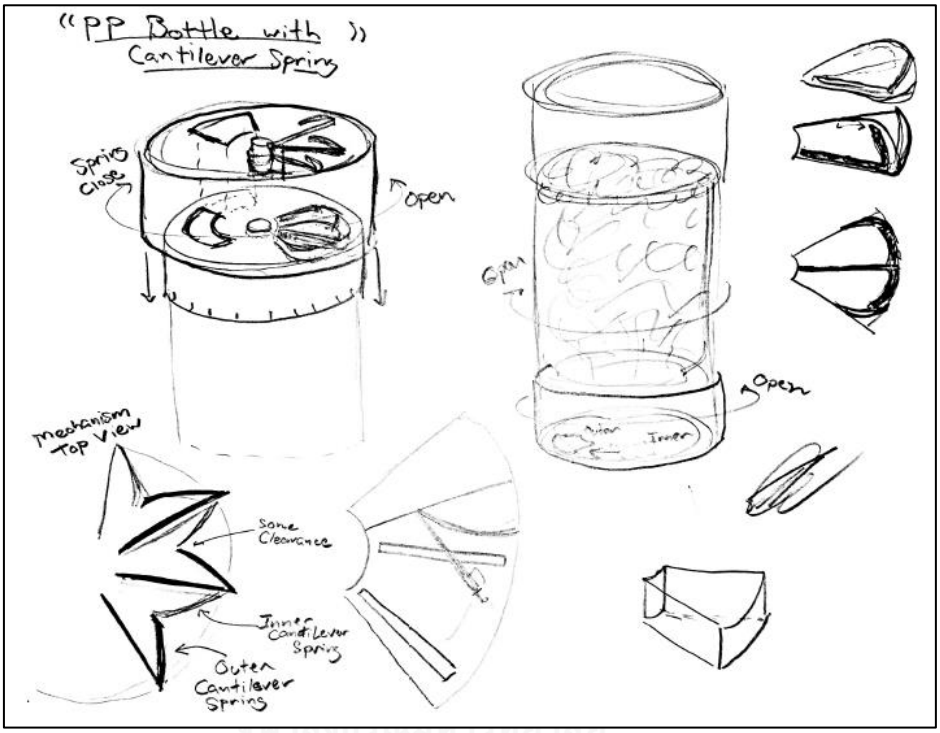


Figure 15: PP Cantilever rotational dispenser concept

From Sketch of Figure 15, it can be seen that the unique design proposed for seasoning powder package is on the rotational motion to drop or sprinkle a controlled amount of content before spring return rotationally. This concept inspired by the pepper grinder, which meets the exact requirement of the dispensing control.

On the down side of the concept, the sealing and the cost of assembly, of part is higher due to the rotational mechanism, moreover, there are a chance of clogging despite the

small number of usage, which is expected to be 10 to 15 times for the standard 90grams pack.

In addition about the flexibility volume and plat form for product variation, the limitation is similar to 4.3.1 section of spice lid design, since the PP bottle will be employed, moreover, the larger quantity of variation will post the higher chance of clogging since more number of seal and reseal operation.

4.6.3 Spring pressing dispenser

Realising the lacking of sealing and resealing mechanism, the innovation design element were inspired by the Mechanical Pencil dispensing, in which for the seasoning powder case, the rough dispensing mechanism is shown in Figure 16.

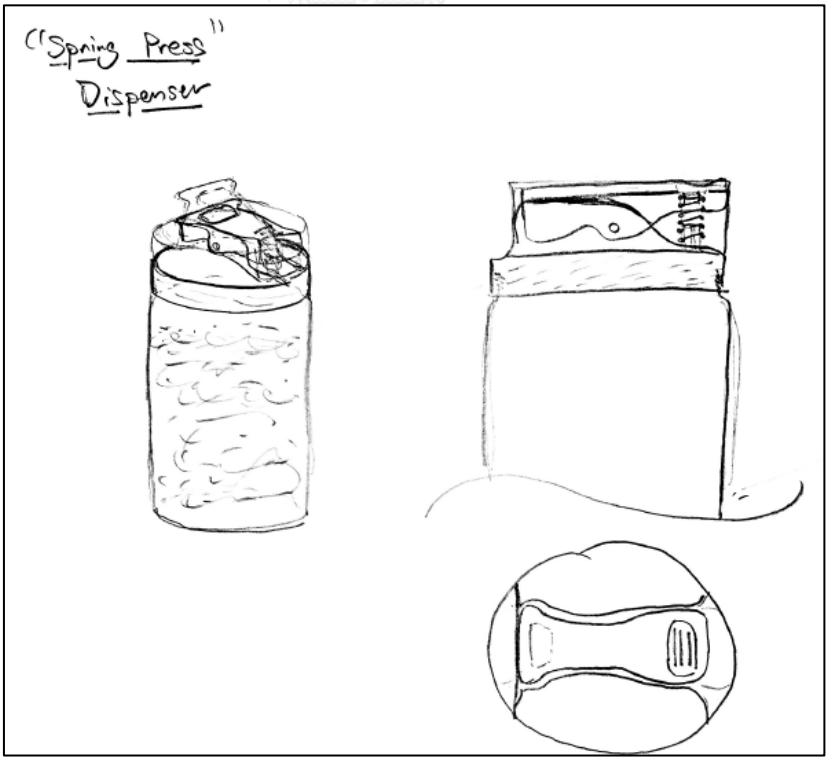


Figure 16: Spring Pressing Dispenser concept

From Figure 16, it can be seen that the bottle portion cannot be commonly used as the previous concept proposed in 4.3.1 and 4.3.2, due to the requirement of the open on the bottom end, as well as the housing for the mechanism for dispensing.

From the concept, the process of manufacturing requires much more complicated stage and accuracy, in which the proposed concept could cost 18 – 21 baht a unit.

With the maximum seal/resealing speed and least effort to operate, there are also the down side regarding to the shelf life since the mechanism could complicate the first seal of the product for shelving.

4.6.4 Zip lock Sachet

Next design concept focuses the design element of the sealing and resealing ability. The source of inspiration is taken from other food-packaging product. With the sealing mechanism, the sachet type of containment is necessary, thus the performance of visibility for reach and grab has been traded-off comparing to the previous bottle containment.

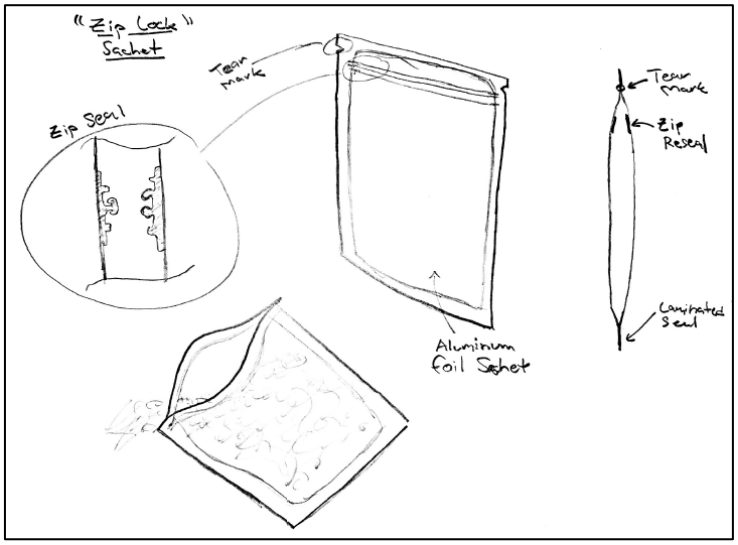


Figure 17: Zip sachet concept

As shown in Figure 17, it can be seen that the shelf life can be improved from a complete seal with the non-permeable aluminium foil. Moreover, the considering the usage of the customer, this concept allows the traditional sideway sprinkling or pouring, thus serve the customer in term of familiarity of package use.

Despite the improve of sealing performance, as well as the speed of reseal that promise the simple use function for customer, the actual usage may post difficulty in pouring due to the obstruction of the zip lock mechanism itself.

Other difficulty that could post the negative impact is the performance of the reseal deteriorates over the cycle of use due to the clogging and jamming of the powder content. This potentially reduces the flexibility in the larger package size.

4.6.5 Resealable sticker Seal Sachet

On the next concept of the package, the inspiration is from the wet tissue product, which can be resealing using the reseal able tape on the mid portion of the pouch. The moisture of the wet tissue could be kept from at least 10 cycle of reseal evidence from the review of the available package in the market. Moreover, the concept has started to be seen on some confectionary package such as walker short bread package. With the application of the reseal tape invention, the seasoning package could be adapted as seen in Figure 18 below.

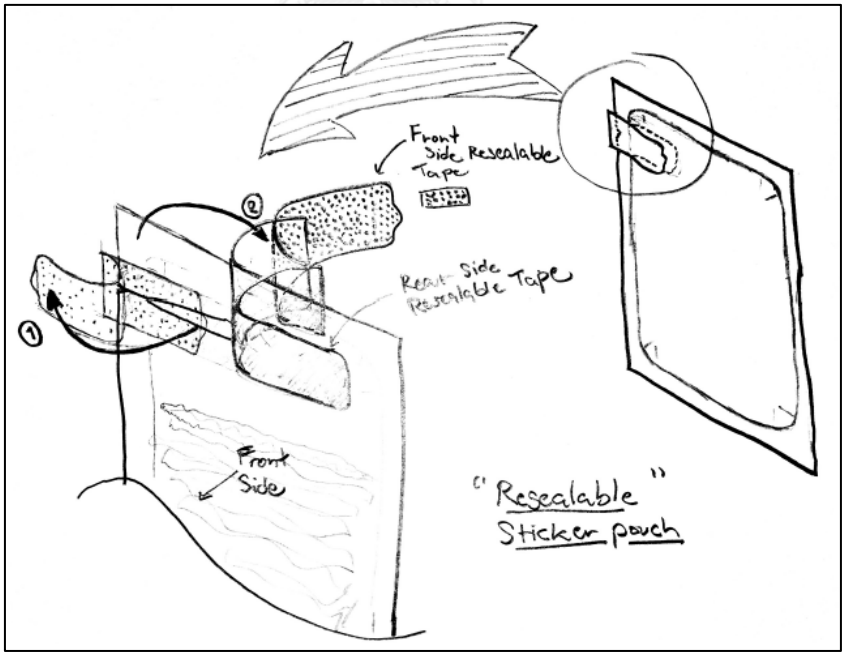


Figure 18: Resealable Sticker Seal Sachet Concept

4.6.6 Modular Sachet

The small sauce sachet has inspired the idea of the modular sachet where a fix quantity of content in each sachet is predefined.

On this concept design concept, the shelf life can be maximised as well as the elimination of the reseal problem faced by customer. The concept image can be seen in the Figure 19 below.

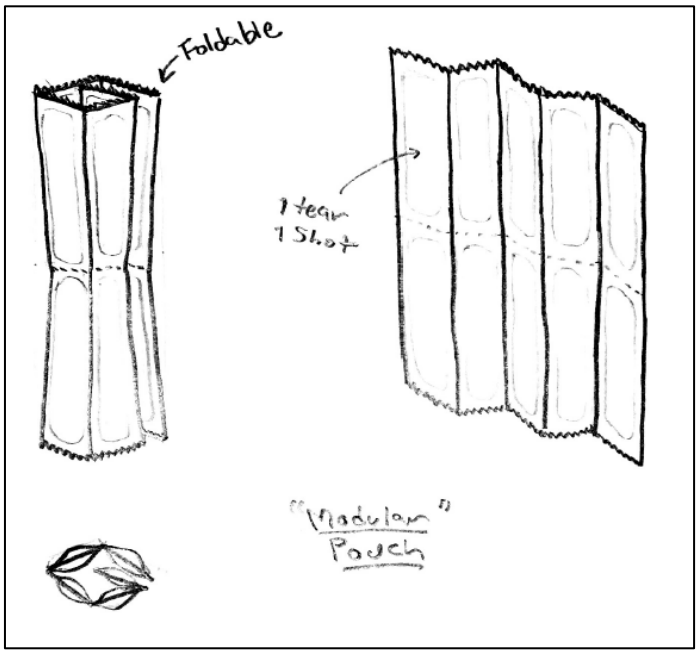


Figure 19: Modular Sachet Concept

4.7 Concepts Assessment result

4.7.1 Customer-end value analysis result

Table 6: Design Concept Ranking based on customer need

Criteria / Concepts					Spice Lid Bottle	Cantilever Dispenser	Spring Dispenser	Zip Lock	Sticker Pouch Side	Modular Pouch
Customer Requirement	Purchasing Decision	0.15	Unit Cost	0.12	3	2	1	6	4	5
			Size Flex	0.03	4	2	1	6	5	3
	Storage Handling	0.2	Visibility	0.04	6	4	5	2	3	1
			Space	0.08	3	2	1	4	5	6
			Shelf Life	0.08	3	1	2	5	4	6
	Actual Use	0.6	Seal / Reopen Time	0.12	2	5	6	1	4	3
			Seal / Reopen Effort	0.15	3	5	6	1	4	2
			Reseal Performance	0.24	1	3	2	4	5	6
			Dispensing Control	0.09	4	5	6	2	3	1
	Disposal	0.05	Recycle	0.01	6	5	4	3	2	1
			Foldable	0.04	3	2	1	4	5	6
Total Weighted score for user requirement					**2.670**	**3.350**	**3.310**	**3.300**	**4.240**	**4.130**

From Table 6, each design concept has been ranked on each quality aspect as well as the weighted score calculated based on the level of focus group concern and performance of the each design concept.

From the weighted average score, the optimum design concept that solve the usage problem of the seasoning powder package is the “Sticker Reseal Pouch”

4.7.2 Marketing-end value analysis result: Marketing Mix

Pricing benefit comparison

For the role of packaging in the aspect of pricing, it can be seen in the market that the packaging of the same content could increase the Manufacturer recommended selling price (MSRP).

With the level of the product content innovation regarding to nutrition and taste, the pricing strategy employed is premium pricing since the product selling point is

considered to be specialty. The image pricing for the product is therefore set by the company to be 44 baht.

To assess the pricing performance of the package design concepts, the pricing information of similar package being deployed in the market must be observed.

For this approach, each product on-shelf that employed the similar package design to each proposed concept has been selected and compared its shelf pricing individually with the same product in conventional package design.

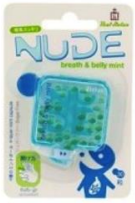
Design Concept	1) Spice Lid Bottle	2) Cantilever Dispenser	3) Spring Dispenser	4) Zip Lock	5) Sticker Pouch Side	6) Modular Pouch
Benchmark Product	Pepper Powder	Black Pepper	Lozenge	Cashew nut	Wet wipes	Tomato sauce
Traditional						
Packaged Value-added						

Figure 20: Selected value added pricing product

As seen in figure 20, the criteria for selecting the product for benchmark for each concept design is restricted to content function to be the same. This enables the comparison of the value being added and at the same time, being purchased by the customer.

As for the result of benchmark, Table 7 below shows the value added performance of each concept. The result data is included in Appendix A

Table 7: Benchmark result of value increase in each package concept

Concept No.	1	2	3	4	5	6
Concept Name	Spice Lid Bottle	Cantilever Dispenser	Spring Dispenser	Zip Lock	Sticker Pouch Side	Modular Pouch
Value added (Multipier)	2.007	6.303	1.637	1.258	1.577	1.258

It can be seen that the highest mark-up for the entire design concept is the Cantilever dispenser and the lowest value added is on the usage of zip pouch and modular pouch.

Even though the selection of product for benchmark for pricing has been set with criteria of content, and size similarity, there is still some discrepancy on brand and purpose of use. Therefore for this stage, the finding reflect the potential value adding level by ranking the highest to lowest performance, without applying the finding value for the new product MSRP.

Promotion benefit comparison

On the role of packaging in the aspect of marketing promotion, the package is the medium to communicate information about the content selling point to urge for the customer purchase (Jenni Hakola, 2013). Once the purchased is done, customer re-buy of the product will occur only when the quality has been perceived up to the expectation created during purchase (Bo Rundh, 2009).

This implies that, the ideal package concept for promotion must allow the use of shape, material, or an adequate platform for the aesthetic design, even though the aesthetic side of the packaging is not in the scope if this research.

Since the product content's selling point emphasises health and taste, by breaking down the aesthetic quality and the functional quality of the package design, the scope of functional quality holds effect in promoting the health rather than taste, while aesthetic can be convey both through the graphic, shape, colours and text.

Therefore, with the scope of functional design, the criteria to judge the design concept is based on the cleanliness of the design, which includes the form being retained from the first use, and the chance of spill from usage. On the criteria of aesthetic, the judgement will be done regarding to the ability of each package design to provide platform for aesthetic as the minimum requirement, and the space for visual attraction as the performance.

Place benefit comparison

For the analysis of the new packaging role under the selling channel, the comparison of each concept capability to be handled on the specific channel must be considered.

From the focus group, it has been observed that the target customer made purchase either through convenient store or super market, this requires a much different in term of the package size.

As the company's intention is to employ the super market retailer and distribution as the main channel, the qualify criteria therefore applies to assess the design concept. This qualify criteria is that the design concept must be compatible for 90 grams and 150 grams of intended size.

The other performance to be used for assessment is the flexibility in size, which provides the platform for the change of marketing mix in term of net content package size.

4.7.3 Marketing-end value analysis result: Competitive performance

Supplier power

For the supplier power analysis, the more unique the design is, the less number of the supplier available for sourcing, in which the higher bargaining power from supplier side is likely.

The criteria is therefore, ranked by the uniqueness of the design, and the level of adaptability required.

In comparison, the most unique design concept is the cantilever design and the spring dispenser type, in which the some part of package must be designed specifically and not readily available in the market.

The following is the resealable tape sachet design, in which the adaptation of the conventional use of the reseal tape must be done, moreover the number of supplier for reseal tape is limited.

The last group is the package that has been deployed for the similar product in the market. Spice Lid bottle, Zip pack, and Modular Sachet has been seen on shelf, thus wide range of supply source, which favour bargaining power for the company.

Buyer Power

Relying on the retailer distribution channel as well as being new in the market, the company has already been in the disadvantage position, where the retailer and distributor has much higher bargaining power.

The risks of being negotiated by the retailer and distributer are in various forms, the term for removal of the product from shelf, the term of responsibility for managing delivery, or forcing on the package delivery size.

Looking on the risk related to the packaging design, the area mainly related is the handling of package by the distributor. The ability of the design concept that its final product could be handled or transported with less cost is favourable.

From this, the criteria for assess of the package performance is then related to the efficiency off bulk delivery package.

Competitive rivalry

New product introduction to the market always face a strong competition in the industry, especially for the consumer product. For the seasoning powder market, there are only few large market leaders in this industry. Most of which have advantage in term of investment capital. Therefore launching of the similar product to target the same segment as defence can be expected.

Anyhow, with the long market leading, the downside of the main market leader may relate to the brand that has been built and expected by customer regarding to the product profile.

Therefore, as in the aspect of ideal packaging design, the company must employ the design that set the product apart from conventional product to avoid the head-on competition. Thus the point to be emphasis is the same for the criteria under the

promotion marketing mix, which are the cleanliness of use, form retain ability after first use, and platform for visual attraction.

Thread of substitution

Considering the re-buy behavior, there is two main drivers for the customer to re-buy. First is the taste of content, and second is the usage feeling.

With the company aim to target the group of health concern individual, the decision of substituting with other product is therefore caused by the failure to create the perception of health on the product. The substitute in this case would be the cheaper conventional seasoning powder package. Another end of substitute causes from the idea of not using seasoning powder is healthier. The possible substitute in this case is to be the less process ingredient such as sugar, fish sauce, salt, or pepper.

The role of the packaging in this context is therefore related to the usage performance, which has been covered in the customer-end value analysis. This strengthens re-buy through the promotion of usage feeling and interaction with the package. However, the taste is not being control under the packaging design scope. The risk of customer refill with substitute product content to the company offered design must be eliminated. Therefore, the criterion to reduce the thread of substitute is given to the design concept that holds ability to prevent reusing of package.

Thread of potential new entry

Since the product is differentiating itself from the current existing product, if it proves successful in capturing the target market, there will quickly be a follower in the competition.

The current barrier that the company holds is the product secret, which involves the processing of higher portion of natural content. However, this is intangible and could be compete with different specification of content but marketing for the same target group.

This lack of barrier of new entry requires the direct solution regarding to the Brand establishment as a first mover of this type of product. However, considering scope of packaging design, the favorable design concept to promote the brand is the uniqueness of the design, thus including the criteria of assessment according to how the design communicate the quality of content through form retain of first use, cleanliness of use, and plat form for visual attraction.

4.7.4 Total weighted score for Marketing Aspect

From the criteria defined in this section, the total marketing favourable score has been weighted with the importance observed from the manager interview. The result of weighted score is shown in the Table 8 below.

Table 8: Total weighted score for marketing aspect

Criteria / Concepts					Weight	Spice Lid Bottle	Cantilever Dispenser	Spring Dispenser	Zip Lock	Sticker Pouch Side	Modular Pouch
Marketing Aspect	Marketing Mix	0.5	Pricing	Value added	0.20	5	6	4	2	3	1
			Promotion	Retain form after use	0.07	6	4	5	3	2	1
				Cleanliness	0.07	4	3	5	1	2	6
				Visual Area	0.07	4	2	3	5	6	1
			Place	Size Flexibility	0.10	4	2	1	6	5	3
	Competitiveness	0.5	Buyer power	Bulk Effeciency	0.10	3	2	1	6	5	4
			Supplier power	Technology requirement	0.15	6	1	2	5	4	3
			Competitve rivalry	Retain form after use	0.03	6	4	5	3	2	1
				Cleanliness	0.03	4	3	5	1	2	6
				Visual Area	0.03	4	2	3	5	6	1
			Thread of substitute	Reuse prevention	0.08	2	3	1	4	5	6
			Thread of new entry	Retain form after use	0.03	6	4	5	3	2	1
				Cleanliness	0.03	4	3	5	1	2	6
				Visual Area	0.03	4	2	3	5	6	1
Total Marketing Aspect Weighted Score						**4.500**	**3.100**	**3.000**	**3.775**	**3.825**	**2.800**

4.8 Operational aspect of design concept

Following the marketing aspect of assessment, the operational aspect is equally important to be assessed for the internal capability advantage, disadvantage, or limitation that could seize the deployment of any one of the design concepts.

4.8.1 Technological aspect

Under this aspect, it will be directly related to the knowhow of the packaging. From the background, the company holds no expertise in designing, forming, or any processing, however, relying on the relation with the supplier.

Under the technological capability of the supplier, the design concept option has been classified in the Marketing aspect assessment under the Supplier power analysis.

From the review of the concept design, the technology in term of manufacturing is existed for all concepts, however the concern point is how easy it can be obtained. By means of obtain, the author refers to the ability to employ the technology either by acquiring, licensing investment, or partial outsource of packaging production.

Directly, the first group of concept that has less problem in term of technology employ are the Spice lid Bottle, and Zip Lock. The follow is the group with moderate technology, which is the Modular Sachet, which requires the material and process knowhow in order to achieve the content volume in limited material.

The next moderate to high technology requirement is the Sticker pouch concept. Regarding to the material property, the available technology is viable in design point of

view. However, the process such as application of resealable tape requires specialise production machine, jig, or tool.

4.8.2 Legal aspect

In Legal aspect, all concepts have been deployed for food grade product in the market. The only concern regarding to the food and medical regulation is on the resealable adhesive, however, the food grade type is also available and can be deployed.

On the intellectual property aspect, as discussed in the Technical aspect, the invention such as cantilever rotating, spring dispenser or sticker reseal may involve license and royalty from 1% to 5% as a common in packaging industry (ipfrontier.com).

As for the rest of the concept option, the market wide usage of spice lid bottle, zip sachet, and modular sachet has made the application common and negligible in royalty rate.

Lastly related to the legal issue, since the company facility is for the chemical warehousing, facility for food as well as the manufacturing equipment must by comply with regulation of food production. Therefore, all the equipment and facility must be procured and take to the consideration of project feasibility.

4.8.3 Organisational & operational aspect

In the aspect of operation, it has been designated that the work force and capital budget will be put through the selling channel of retailing. On the marketing team consist of a project manager and four staffs, where the manufacturing team has been

recently established by assigning the purchasing manager as a lead in procuring the facility and machinery with a team of five technicians.

The most important concern on the new organisation team is the skill in the field. Even though the team have had a background on the chemical product procurement and marketing, the packaged food as an end product, which requires dealing from the start of raw material to the customer end through retailer.

Therefore in the scope of package design and manufacturing, the skill and difficulty that may occur related to the design under current organisation will directly related to the technical difficulty of the concept design. Thus operational concern will put emphasize for favourable to the less technical requirement concept, where only the design requirement will be proposed from the company to outsource consultant or supplier for further facility set-up.

4.8.4 Scheduling aspect

Regarding to the scheduling, there has not been designation of deadline date for the start of the production. However, in regard to the package design, the concept that requires shorter lead-time for design requirement set-up as well as less number of trails is favourable.

4.8.5 Economical aspect

From all operational aspect that has been analysed, the decision of the most suitable will concept will be restricted by the investment capital. Moreover, each design concept requires different level of investment in term of manufacturing equipment. Therefore, the total payback period is to be compared from the estimate investment of each particular design concept.

Before payback period can be analysed, the information such as sales forecast has been discussed with the company who is currently outsourcing for the marketing insight, which produced the prospect sales in different scenario from worst case to best case.

Moreover, acquired information is the estimation of the equipment of each concept design, in which the concept has previously been discussed with the procurement manager for research on the estimation with various equipment suppliers as well as the packaging supplier.

The calculation of the payback period is shown in Appendix B. Anyhow, as for the final result, Table 9 below shows the estimated payback period if each concept to be deployed.

Table 9: Estimated payback period of each package concept investment

Scenario	ESTIMATED PAYBACK PERIOD (YEAR)					
	Spice Lid Bottle	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
Worst case	3.93	4.36	4.28	3.65	3.73	3.52

As the result shows in Table 9, the payback period range from 3.5 year to 4.4 year, which according to project feasibility, it ranges from average to questionable in case payback period is over 4 years (Rodney Overton, 2007).

4.8.6 Total weighted score for Operational Aspect

From the review of the criteria according to TELOS assessment model, the result of discussion with company shows that each concept exceed minimum requirement, however, on the performance side of each concept according to TELOS, the following weighted important score has been constructed In Table 10.

Table 10: Total weighted score for operational aspect

Criteria / Concepts				Weight	Spice Lid Bottle	Cantilever Dispenser	Spring Dispenser	Zip Lock	Sticker Pouch Side	Modular Pouch
Operational Aspect	1.0	Technological	Availability & Application	0.20	6	1	2	5	4	3
		Legal	Intelectual Property free	0.10	6	1	2	5	3	4
		Organisational	Skill in design	0.20	6	1	2	5	4	3
		Schedule	Less design & trial time	0.10	6	1	2	5	4	3
		Economical	Payback period	0.40	5	1	2	4	3	6
Total Marketing Aspect Weighted Score					**5.600**	**1.000**	**2.000**	**4.600**	**3.500**	**4.300**

4.9 Optimal design concept for both Manufacturer and Customer end

With the previous ranking of each separated aspect, scoring can be combining giving the weight equally between the manufacturer requirement and the customer requirement.

Table 11: Final Design concept assessment

Criteria / Concepts	Weight	Spice Lid Bottle	Cantilever Dispenser	Spring Dispenser	Zip Lock	Sticker Pouch Side	Modular Pouch
Usage dimension	0.5	2.670	3.350	3.310	3.300	4.240	4.130
Marketing Dimension	0.25	4.500	3.100	3.000	3.775	3.825	2.800
Operational Dimension	0.25	5.600	1.000	2.000	4.600	3.500	4.300
Total Selection weighted Score		**3.860**	**2.700**	**2.905**	**3.744**	**3.951**	**3.840**

Taken the previously weighted score from all dimensions, i.e. Customer usage, Marketability, and operability, the final design concept assessment can be done given equal important of both manufacturer end and customer end. The most optimal design concept is the “Sticker Pouch” design concept. From the result, the customer best overall concept is feasible and also holds merit in marketing, and operation aspect.

4.10 Package Design

Following the product design FMEA framework guideline (Dyadem press, 2004), the author has modified the framework in according to the required application, which is to identify the engineering concern point to be studied, as well as pointing the essential design specification that ensure functionality.

The following sections are the result of the failure mode and effect analysis and the established design requirement specification separated by the design component.

4.10.1 Sachet

Table 9: Modified FMEA worksheet for Seasoning Powder Package Sachet

No.	Item	Function	Failure Mode	Effect of Failuremode	S	Cause Mechanism	O	Current Design Control Prevention	Design Control Detection	D	Risk Priority Number (RPN)
1.1	Pouch / Sachet	Prevent Moisture before open	Moisture got in	Short shelf life	7	Moisture penetration through permeable material	6	Sealable material type for pouch	None	10	420
1.2	↑	↑	↑	↑	7	↑	6	Thickness of material layer	None	10	420
1.3	↑	Compactness for shelf space	Overly pact content → Incomplete seal	Breakage Damage	8	Required filling amount restraint by air tightness	3	Sachet dimension to allow intended content and minimize air	Filling process defect control detection	4	96
1.4	↑	Contain intended content amount	Overly pact content → Spill when tear open	Inconvenience of tearing/ Pouring usage	6	Content fill level higher than tear mark / too little air	6	None	None	10	360

From the worksheet seen in above Table 9, there are 4 concern failure modes that involve the sachet component of the design. The main functions were identified, and the concern area that requires specific design detail to prevent the failures is the design indication of material type, its thickness, Dimension, and the filling portion.

First area of concern is the gas or moisture prevention, in which the initial concept design has not yet stated clearly. The second area is the dimension of the sachet, which affects the filling process and the spillage problem of first tear.

According to Table 9, the Risk Priority Number (RPN) which is the multiplication of Severity (S), Occurrence (O), and Detectability (D) are rated according to FMEA criteria Guideline (Dydem, 2004), and found to be high since there is not yet design measure in for the identified failure mode. Noted the criteria for judging is designated in Appendix C, D, and E.

Table 10: Sachet component of the package

No.	Design Requirement Sachet
1.1	Benchmarked and confirm suitability of Alluminum LLDPE with packaging expert.
1.2	Confirm reliable source of material
1.3	Set requirement dimension for content and Nitorgen fill by consulting with packaging expert.
1.4	Benchmark content sitting height and set content / gas sachet portion.

In Table 10, the design requirement to remedy the failure mode identified in Table 9 is therefore in 4 ways.

First is the specification of sachet material to be Aluminium/LLDPE and it thickness. The second is the requirement of action in reviewing the reliable supply source. Third is the benchmark result for the package size, in which the target is to allow margin of air space at top of the sachet.

The design requirements mentioned above requires the information research through consultation with packaging expert opinion, which has been done before design specification has been fixed.

The last area of design concern is the follow-through from the third concern, which is the problem of spillage from tearing. This requires a benchmark study of sachet size in the market.

4.10.2 Edge binding

Table 11: Modified FMEA worksheet for Seasoning Powder Package Edge Binding

No.	Item	Function	Failure Mode	Effect of Failure mode	S	Cause Mechanism	O	Current Design Control Prevention	Design Control Detection	D	Risk Priority Number (RPN)
2.1	Edge Seal	Bind the egde of sachet from moisture / leak	Over/Under binding process	Breakage Damage	8	Binding Process too long/short	3	Supplier expertise	Design Specification for and process control	4	96
2.2	↑	Retain sachet shape from binding area	Handling Damage	Breakage Damage	8	Insufficient edge strength for handling	2	Benchmark against market sachet design with adequate strength	None	9	144
2.3	↑	↑	Could not reseal with sticker from wrinkling	Decrease or dissabling in Sticker reseal function	8	Insufficient corner rigidity, incomplete reseal	7	Carry-over the binding clearance from benchmark	None	10	560

On the edge sealing package component, the main failure mode is on the wrinkle, which causes the incomplete reseal. Other failure mode includes the production and the handling breakage from insufficient binding strength.

Table 12: Edge binding component of the package

No.	Design Requirement for Edge seal
2.1	Produce clear design requirement regarding to binding dimension and confirm with packaging expert.
2.2	Set minimum binding edge clearance through benchmark.
2.3	Increase edge clearance. Move Tear line upward close to top. Shorten tear line. Flat edge area indication.

Similarly to the Sachet design requirement setting, the failure mode of over binding and under binding must include in the discussion with packaging expert.

The main concern design requirement to reduce the failure in 2.3 according to Table 12 is to ensure clearance of edge binding, Control tear line close to top and flat area where the resealable tape being applied. Other breakage failure mode must be controlled by the benchmark to find the largest clearance and flattest edge packaging available in the market.

4.10.3 Tearing Mark

Table 13: Modified FMEA worksheet for Seasoning Powder Package Tear mark

No.	Item	Function	Failure Mode	Effect of Failure mode	S	Cause Mechanism	O	Current Design Control Prevention	Design Control Detection	D	Risk Priority Number (RPN)
3.1	Tear Mark	Accommodate tearing	Tear angle out of Sticker seal area	Decrease or dissabling in Sticker reseal function	6	Inaccurate leading angle	7	Arrow Shape blanking mark	None	2	84
3.2	↑	↑	↑	↑	6	Tearing longer than reseal able tape (Difficult to control)	7	Half sachet width reseal able tape	None	7	294

For the tear mark design element, there is one failure concern the tear line going over the reseal able area. The first cause is that the tear mark may lead the tear line out of the tape seal area, in which the next reseal will not be complete. The second cause is related to the length of tearing, which differs from customer to customer.

Table 14: Tear mark component of the package

No.	Design Requirement for Tear mark
3.1	Clearly indicate position and angle of tear mark.
3.2	Implement break guideline on Resealable tape.

The design requirement to remedy the concern failure mode is to indicate the shape and position of tear mark, as well as implementing the slit line on resealable tape to stop the tear line to intended suitable length.

4.10.4 Resealable Tape

The Last component of the design is the resealable tape. According to the FMEA worksheet shown in Table 15, the main failure is directly of the function of sealing.

Table 15: Modified FMEA worksheet for Seasoning Powder Package resealable tape

Item	Function	Failure Mode	Effect of Failure mode	S	Cause Mechanism	O	Current Design Control Prevention	Design Control Detection	D	Risk Priority Number (RPN)
Reseal able tape Sticker	Seal Tear line	Improper reseal from miss removal	Loss reseal able function	6	Reseal able tape removed unintentionally	6	Half sachet width reseal able tape	None	7	252
↑	↑	Adhesive deteriorate	Unreliable sealing performance	7	Seasoning powder content on adhesive mating surface.	8	Benchmark Tape area for lower chance of powder sticking.	Dimension control	8	448

The first failure mode is related to the miss-use of the reseal tape, in which the customer may unintentionally remove the tape. The second failure mode is related to the deterioration of the adhesive, in which the cause could likely be the sticking of the seasoning powder content to the adhesive area.

Table 16: Resealable tape component of the package

No.	Design Requirement for Resealable Tape
4.1	Design slit mark to prevent miss removal.
4.2	Study the modification of seasoning powder into granular type.

As for the design requirement to remedy the identified failure modes, the design of the slit line on the resealable tape on the lower rear side could provide a stop on the tearing of the main sachet.

As for the failure mode adhesive deterioration from powder sticking, which has high Risk Priority Number, the remedy for reducing the risk is the modification of the content form from powder to granule.

4.11 Component Design

From section 5.1, the essential design requirement that needed to be controlled by the design specification can be listed as a check sheet of design concern item based on the highest to lowest “Risk Priority Number”. The usage of the design concern check list is in two fold, first is to breakdown the design into manageable component (Wen chuan, 2001), second is to be used as a based requirement either in-house or outsourcing design requirement.

Table 17: Component or Part design specification requirement

Priority	Component	Design Specification Requirement Check	Risk Priority Number (RPN)
1	Edge Seal	Edge clearance. Tear line H-direction. Tear line length. Flat edge surface area.	560
2	Resealable Tape	Adhesive strength, Tape thickness, Content powder dispersion reduction.	448
3	Sachet	Benchmarked and confirm suitability of Alluminum LLDPE with packaging expert.	420
4	Sachet	Material quality control for reliability.	420
5	Sachet	Content sitting height (content / air proportion).	360
6	Tear Mark	Implement slit mark on Resealable tape to stop the sachet tear.	294
7	Resealable Tape	Implement slit mark to prevent miss removal.	252
8	Edge Seal	Minimum binding edge clearance through benchmark.	144
9	Sachet	Set requirement dimension for content and Nitorgen fill by consulting with packaging expert.	96
10	Edge Seal	Produce clear design requirement regarding to binding dimension and confirm with packaging expert.	96
11	Tear Mark	Clearly indicate position and angle of tear mark.	84

4.11.1 Core component design

From the design specification requirement check in Table 17, the design element concern points have been established. The first design specification, which does not require the packaging expertise in term of material type and volume, has been set as shown in Figure 21 below. In the other word, the core component of the resealing mechanism of “Resealable Tape” and “Edge Binding” has been developed before conducting the design review with packaging experience individual.

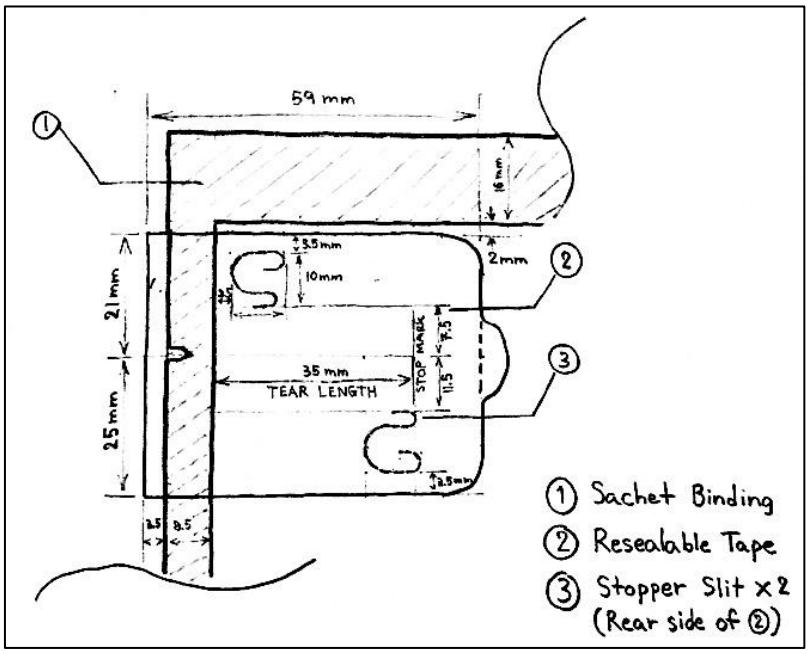


Figure 21: Core component design

It can be seen in the first specification that the dimension regarding to the resealable Mechanism has been set with the dimension benchmarked from market available product. This ensures the manufacturability of the new packaging.

Indicated in ① “Sachet Binding” that the top binding width of 16mm has been originated from the Benchmark of other sachet food package (Instant Porridge Rice) that

holds adequate rigidity. The side has also set to 8.5mm as a result of benchmark from other seasoning powder brand, but seeking the narrowest width to minimise the resealable Tape sealing leak.

For the resealable tape specification in ②, and the slit mark in ③, the benchmark of the resealable tape application is done on the biscuit pouch package and the wet tissue package, which in turn translated into the size and clearance of the tape set in the new package. The minimum clearance observed from the edge of tape to the open is minimum 7.5mm, in which the first specification shown has set accordingly.

Moreover on the Reseal Tape design, the slit mark has been placed to the back attaching the rear side of the sachet to the resealable tape. This provides the fool proof to prevent miss tear and misses removal of the tape.

Furthermore, the paper mock-up of the core resealing function has also been constructed for reviewing as shown in figure 22 below (more detail in Appendix F).

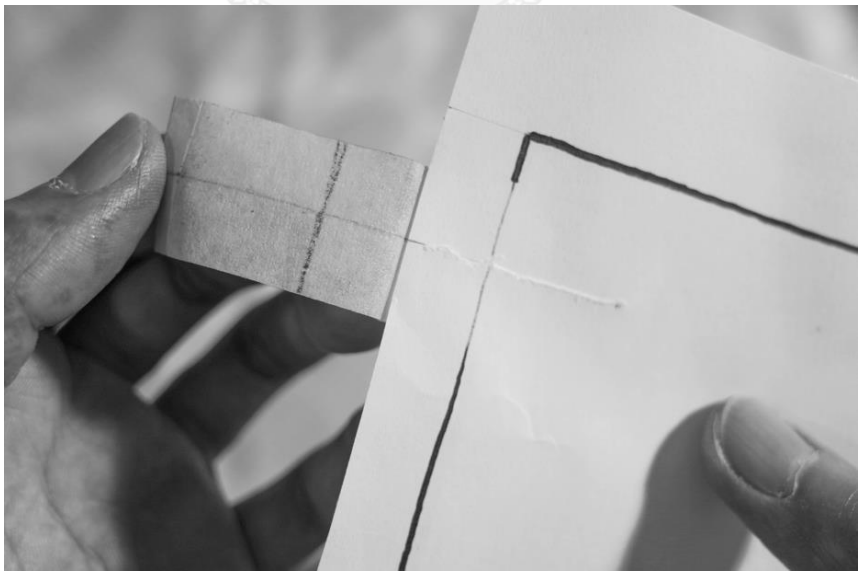


Figure 22: Initial Design Reseal tape

4.11.2 Design Review

With the start-up product packaging design, the core function design of reseal and edge seal has been set from the researched requirement. However, with the limited experience on the characteristic of each element such as material type, adhesive strength, and fill volume, it is essential that the design review with the expert in the packaging field is essential to pin point on how to achieve the required quality of each sub component as well as feasibility of deployment (Anil Mital, 2004).

Moreover, to ensure the function in term of usage is being met, the participant of focus group has also been requested to comment on the core design from the paper mock-up.

Component design review with expert

With the design requirement check sheet and the core function design in place, the design review can be done. The consultant with the packaging source who has experience on the pouch package and other consumer product packaging such as diapers and wet wipes were arranged.

Regarding to the performance of the resealing, the resealing performance depends heavily on the flatness of the surface, however with the core design specification, the comment of concern is on the edge relieve of the sachet where the reseal tape is being apply.

From this concern, the options that are available are to restructure by removing the edge completely for flat surface, or retaining the core structure but research on the adhesive of resealable tape.

As for remedy, the removing of the edge may give a higher adhesive performance. This is based on the reason that it is practical to keep the core design in-house and not

relying on other source of knowhow such as special adhesive property, which required to be outsourced.

Component design review with customer

From the expert point of view, the review of the design mock-up and other concept has also been conducted with the previous focus group in order to obtain comment in the usage point of view. (Appendix G)

The result of discussion shows the concern of the tearing mark of first seal, even though with the fool proof slit implemented, it still requires some concentration if tear by hand.

Other also comment regarding to use of the scissor to first tear, however, this greatly reduce the convenience of usage.

Moreover on the tear line, some comment has been received regarding to the concern of insufficient length of the tear line. In which this has been identified from FMEA that holds the trade-off with the rigidity and accuracy during resealing.

4.11.3 Design change

As from the information gathered from the design review, the main element that needed to be address for design refinement is the tear line and the flat binding edge.

Other element to be retained is regarding to the fool proof slit mark, therefore in order to respond to the comment, the type of sachet with three edges, in other word, a half-fold binding. This results in one side of curve and smooth surface, which provide flatter area for adhesion.

On the side of the customer respond, the difficulty of first tear and the concern point of the length of tear line can be responded by changing the open orifice to oval shape. The core component design has therefore changed as seen in figure 23 below (more detail figure in (Appendix H)

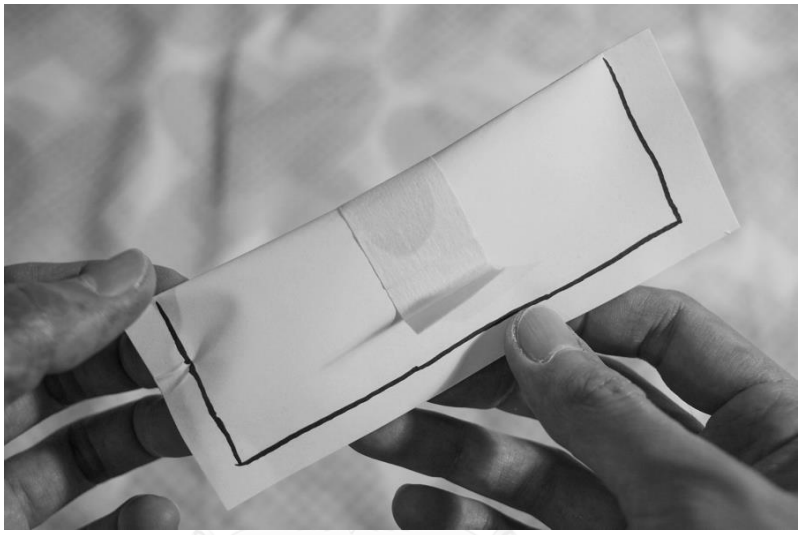


Figure 23: Design Change Mock-up

With the component design change, the top two highest priority of component failure mode shown in Table 17 could be eliminated, thus eliminate the risk priority number by 1,008.

Chapter 5: Conclusion & Discussion

Following the generic framework of new product development as well as the quality function deployment, this research has employed the qualitative research of focus group to gather the usage ethnography of seasoning powder package. The information gathered has been translated into the functional aspect of requirement, and 6-concept designs innovation has been proposed with the source of inspiration from other product package in order to create the total solution of seasoning powder package usage.

On the transition to the second phase of quality function deployment, the concept has been assessed through the importance weighting in term of its alignment of customer needs, marketing mix, marketing competitiveness, and the operational performance, which resulted in the highest potential concept to be deployed.

The last design process under the quality function deploy has been the translation of the functional requirement to the component or part requirement, in which the failure mode and effects analysis framework has been employed to ensure the customer voice has been processed through the design and development. Moreover as the result of FMEA, the design specification has been set and design review has been conduct to realise the detail of part requirement as well as refining and design change to be ready for later stage of process design.

5.1 The benefit of the research

The direct benefit of the research is on the decision making of the company towards the judgement of various type of package innovation, which suitable for both usage culture of the seasoning powder product as well as the suitability under the firm's business context. Moreover the design refinement to the component level simplify and reduce the design lead time as well as reducing the number of trial and error as opposed to the usual risk of making decision without a systematic informed decision.

5.2 Contribution to the industry

The research is useful for the package design of other new product or new product oriented start-up which seeks the study approach to support on realising the most suitable package for cohesive new product introduction by the application of the research methodology presented.

5.3 Limitation of the research

The two main limitations of this research are regarding to the number of concept able to be proposed as candidate, and the number expert available for the design review.

These two limitations hold large impact on the scale and the quality of the final component design requirement being produced. Anyhow, this is largely depending on the scale of investment for the new product, since the case being presented for packaging design is a start-up, where there is limited direct innovation and expert in the field.

5.4 Further study

This research scope is to realise the component level requirement of the home used seasoning package design, however further study regarding to the process design can be done further to drive down the cost and thus further improve regarding to the total package performance in practical business context.

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APPENDIX

Appendix A – Pricing mark up from package deployment

Value Adding through Spice Lid bottle						
Goods	Package	Size (g)	Price (b)	per size	Average	Difference
Pepper	Pouch	100	74	0.740	0.700	**2.0068**
		40	37	0.925		
		100	79	0.790		
		80	27.5	0.344		
	Spice Lid Bottle	60	71	1.183	1.404	
		20	36	1.800		
		60	81	1.350		
		110	135	1.227		
		50	73	1.460		

Value Adding through Rational Cantilever Bottle						
Goods	Package	Size (g)	Price (b)	per size	Average	Difference
Black Pepper	Sachet	70	49.5	0.707	0.707	**6.3030**
	Rotating	35	156	4.457	4.457	

Value Adding through Spring press dispensing Package						
Goods	Package	Size (pcs)	Price (b)	per size	Average	Difference
Lozenges	Plastic box	25	28	1.120	1.120	**1.6369**
	Dispense	30	55	1.833	1.833	

Value Adding through Zip Sachet						
Goods	Package	Size (g)	Price (b)	per size	Average	Difference
Casshew nuts	sachet	200	109	0.545	0.586	**1.2584**
		400	222	0.555		
		35	23	0.657		
	Zip sachet	170	115	0.676	0.737	
		180	130	0.722		
		160	130	0.813		

Value Adding through Resealable sticker tape package						
Goods	Package	Size (pcs)	Price (b)	per size	Average	Difference
Wet wipes	Single pouch	60	80	1.333	1.467	**1.5767**
		50	80	1.600		
	Sticker reseal	10	27	2.700	2.313	
		10	23	2.300		
		10	25	2.500		
		20	35	1.750		

Value Adding through Zip Sachet						
Goods	Package	Size (g)	Price (b)	per size	Average	Difference
Tomato sauce	Bottle	600	32	0.053333333	0.060	**1.2576**
		300	20	0.066666667		
	Module sachet	1100	83	0.075454545	0.075	

Note: Price information taken from www.priceza.com on 6 June 2016

Appendix B – Payback Period calculation

			Cost / unit					
UNIT COST	Unit Cost 0.12Baht/g	Material + Labour + OH / (g)	**Spice Lid Bottle**	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
	90g Size	11.7	0.06	0.13	0.14	0.13	0.07	0.04
	150g Size	19.5						

				Margin / unit					
MARGIN		Selling Price	After Retail & Distributer	**Spice Lid Bottle**	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
	90g Size	44	17.6	0.0649	0.0641	0.0640	0.0641	0.0648	0.0651
	150g Size	79	31.6	0.0803	0.0798	0.0797	0.0798	0.0802	0.0804

		Capital required					
INVESTMENT	ASSET BUDGETTING	**Spice Lid Bottle**	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
	Packaging Machinery & Filling System	1,800,000	2,700,000	2,400,000	400,000	700,000	400,000
	Powder content total processer						3,000,000
	Granule compacter						1,000,000
	Facility						6,000,000
	Total Estimated	11,800,000	12,700,000	12,400,000	10,400,000	10,700,000	10,400,000

					Expense/yr					
	Scenario	Type	Unit/day	Revenue/yr	**Spice Lid Bottle**	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
SALES FORECAST "Outsource Research"	Worst case	90g Unit	720	8,884,800	5,724,000	5,751,720	5,755,680	5,751,720	5,727,960	5,716,080
		150g Unt	380							
	Normal	90g Unit	3600	35,323,200	22,986,720	23,105,160	23,122,080	23,105,160	23,003,640	22,952,880
		150g Unt	1100							
	Best case (Full Cap)	90g Unit	7200	71,784,000	46,677,600	46,917,000	46,951,200	46,917,000	46,711,800	46,609,200
		150g Unt	2300							

	EBIT					
Scenario	**Spice Lid Bottle**	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
Worst case	3,160,800	2,976,426	2,972,664	3,039,088	2,998,998	3,168,720
Normal	12,336,480	11,607,138	11,591,064	11,851,499	11,703,582	12,370,320
Best case (Full Cap)	25,106,400	23,623,650	23,591,160	24,120,990	23,818,590	25,174,800

	DEPRECIATION (Straightline 20% yearly)					
	Spice Lid Bottle	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
Depreciation	2,360,000.0	2,540,000.0	2,480,000.0	2,080,000.0	2,140,000.0	2,080,000.0
Royalty Fee	0	0.05	0.05	0.03	0.05	0

	AFTER TAX & DEPRECIATION					
Scenario	**Spice Lid Bottle**	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
Worst case	3,000,640	2,910,962	2,898,764	2,847,270	2,870,148	2,950,976
Normal	10,341,184	9,793,710	9,768,851	9,897,199	9,790,866	10,312,256
Best case (Full Cap)	20,557,120	19,406,920	19,368,928	19,712,792	19,482,872	20,555,840

Scenario	ESTIMATED PAYBACK PERIOD (YEAR)					
	Spice Lid Bottle	**Cantilever Dispenser**	**Spring Dispenser**	**Zip Lock**	**Sticker Pouch Side**	**Modular Pouch**
Worst case	3.93	4.36	4.28	3.65	3.73	3.52

Appendix C – Design FMEA Severity ranking (S) criteria

Effect	Rank	Criteria
None	1	No effect.
Very Slight	2	Negligible effect on product performance. User not affected.
Slight	3	Slight effect on product performance. Non-vital faults will be noticed most of the time.
Minor	4	Minor effect on product performance. User slightly dissatisfied.
Moderate	5	Reduced performance with gradual performance degradation. User dissatisfied.
Severe	6	Product operable and safe but performance degraded. User dissatisfied.
High Severity	7	Product performance severely affected. User very dissatisfied.
Very High Severity	8	Product inoperable but safe. User very dissatisfied.
Extreme Severity	9	Product failure resulting in hazardous effects highly probable. Compliance with government regulations in jeopardy.
Maximum Severity	10	Product failure resulting in hazardous effects almost certain. Non-compliance with government regulations.

*Modified from Dyadem press 2004

Appendix D – Design FMEA Occurrence ranking (C) criteria

Occurrence	Rank	Criteria
Extremely Unlikely	1	Failure highly unlikely.
Remote Likelihood	2	Rare number of failures likely.
Very Low Likelihood	3	Very few failures likely.
Low Likelihood	4	Few failures likely.
Moderately Low Likelihood	5	Occasional failures likely.
Medium Likelihood	6	Medium number of failures likely.
Moderately High Likelihood	7	Moderately high number of failures likely.
High Likelihood	8	High number of failures likely.
Very High Likelihood	9	Very high number of failures likely.
Extremely Likely	10	Failure almost certain.

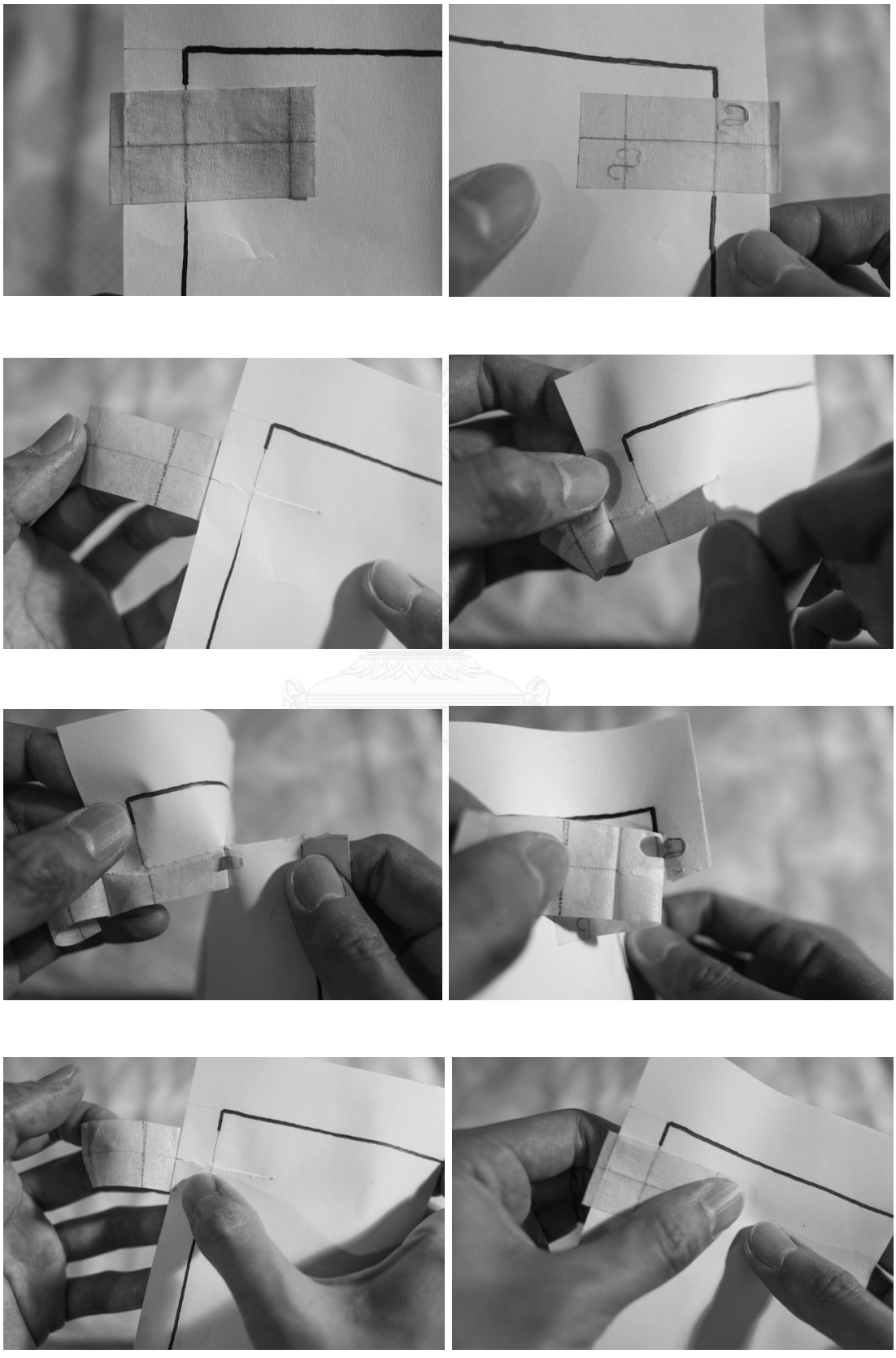
*Modified from Dyadem press 2004

Appendix E – Design FMEA Detection ranking (D) criteria

Detection	Rank	Criteria
Extremely Likely	1	Can be corrected prior to engineering prototype.
Very High Likelihood	2	Can be detected and corrected prior to engineering design release.
High Likelihood	3	Has high effectiveness.
Moderately High Likelihood	4	Has moderately high effectiveness.
Medium Likelihood	5	Has medium effectiveness.
Moderately Low Likelihood	6	Has moderately low effectiveness.
Low Likelihood	7	Has low effectiveness.
Very Low Likelihood	8	Has lowest effectiveness in each applicable category.
Remote Likelihood	9	Is unproven, unreliable or unknown.
Extremely Unlikely	10	No design technique available or known, and/or none is planned.

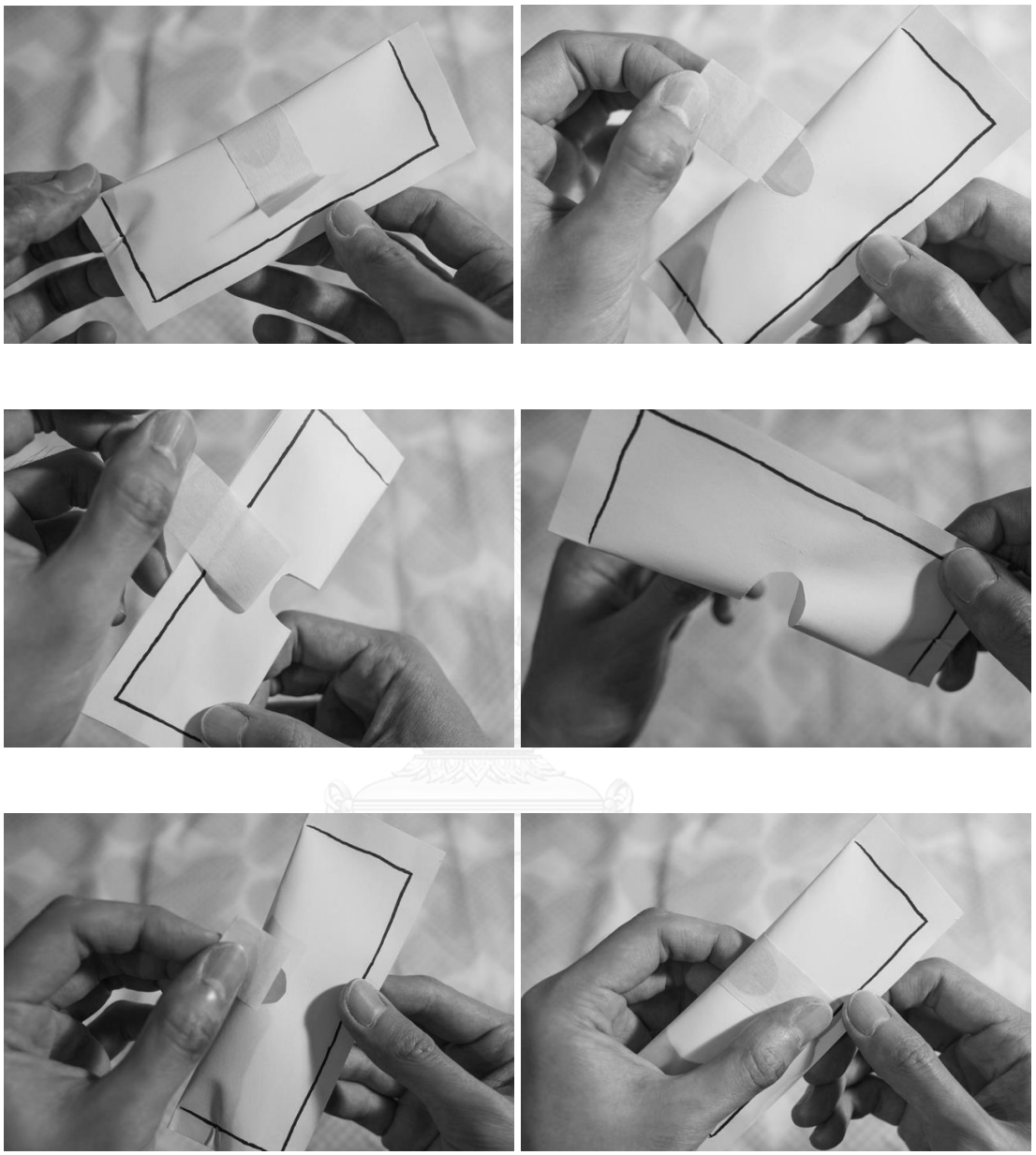
*Modified from Dyadem press 2004

Appendix F – Initial design Resealing Mechanism Mock-up



Appendix G – Focus Group Discussion

Appendix H – Design change mock-up



VITA

The author, Gaj Kositratna, has joined the graduate school major in Engineering Business Management. During the research, the author was employed under an automotive research and development firm in Thailand, however striving to support family business, which related to the chemical raw material trading, and consumer product material trading.