



## A Study of Supply Chain Management in Food Export Industry: A Case Study of a Crispy-Fried Fish Skin Company

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### Abstract

The research of “A study of supply chain management in food export industry: a case study of a crispy-fried fish skin company” was qualitative research, which the objectives were 1) to study the supply chain management of a crispy-fried fish skin product in the food export industry, 2) to analyze the supply chain management problems of a crispy-fried fish skin company, and 3) to make the guidelines of the supply chain management for a crispy-fried fish skin company. The instruments used for data collection were observation and in-depth interviews with the administrator and two keymen of a crispy-fried fish skin company, including data from secondary sources. The qualitative analysis tools were content analysis, value chain analysis, SWOT analysis, and 7R’s of logistics of a crispy-fried fish skin company. The research results revealed that most of the crispy-fried fish skin factories encounter almost the same problems of the supply chain, especially the upstream; fish skins as raw material. Because the raw materials of this industry are by-products of the fish-meat industry, so they often face shortages of raw materials. Therefore, supply chain management at inbound logistics is the place deal deliberately with, and inventory of raw materials is necessary to plan extensively for the annual production plan. However, solving the problems in each point cannot be done separately, but integrally.

**Keywords:** *Crispy-Fried Fish Skin, Supply Chain, Value Chain, Food Export Industry*

### 1. Introduction

Thailand has long been called “the Kitchen of the World” for more than two decades. There are many reasons to support this statement, such as the abundant natural resources, highly skilled workforce, and strength in research. In leveraging its geography with local agricultural resources, the Thai government designated the food industry as one of ten key growth engines in line with the “Thailand 4.0” economic model (The Federation of Thai Industries, 2017). Moreover, Thai food export value is expected to rise by 10.2-12.2% year-on-year to 1.08-1.10 trillion baht in 2021. The ongoing spread of COVID-19 infections in many countries around the world will benefit the Thai food processing business because foreign customers tend to buy and stockpile food products during lockdown (Apisitniran, 2021). As shown in Table 1: Thailand’s Food Export Ranking, Thailand was the first exporting country of many food processing items.

**Table 1** Thailand’s Food Export Ranking in 2018

Items of Food Processing	Ranking of world exports	Percentage of world exports
Cassava products	1 <sup>st</sup>	91%
Canned tuna	1 <sup>st</sup>	32%
Canned pineapple	1 <sup>st</sup>	35%
Rice	2 <sup>nd</sup>	23%
Sugar	13 <sup>th</sup>	13%
Ready to Eat products	11 <sup>th</sup>	3%

Source: National Food Institute (2017)

Thailand’s food processing industry has developed rapidly and is one of the most developed in South East Asia, with more than 10,000 food and beverage processing factories (United States Department of



Agriculture, 2020). There are three types of food processing; minimally processed, moderately processed, and highly processed. These food processing products have finally been developed to be ready-to-eat products. Ready-to-eat products can be divided into two types of products that are ready meals and snacks. Urbanization and increasingly busy lifestyles are the main drivers of the double-digit ready meal growth rate in Thailand. The country is currently the 9<sup>th</sup> largest ready meal exporter in the world, accounting for a 3.7% market share in 2016 (National Food Institute, 2017). Thus, the demand for ready-to-eat food products has continuously increased in domestic and overseas markets.

**Table 2** Domestic Food Product Sales 2019

Domestic Food Product Sales 2019			
Product	Unit	2018	2019
Soy sauce	liters	88,072,524	90,86,968
Fish sauce	liters	85,245,184	84,180,393
Frozen & Chilled chicken meat	tons	1,792,769	1,851,514
Sugar	tons	1,558,418	1,648,512
Pasteurized milk	tons	1,009,484	1,070,399
Yoghurt drinks	tons	446,697	452,155
Fruit juice	tons	386,057	431,101
Instant noodles	tons	216,056	228,236
Ice cream	tons	114,465	117,238
Canned sardines	tons	66,561	77,656
Sausage	tons	30,658	44,418
Frozen fish	tons	35,370	43,306
Cake	tons	38,594	40,221
Canned Tuna	tons	28,494	25,299
Crackers	tons	29,960	27,865
Frozen shrimp	tons	22,225	27,108
Canned pineapple	tons	29,405	20,793
Dried fruit and vegetables	tons	6,278	8,347
Cookies	tons	7,180	7,600
Bacon	tons	4,130	4,206
Ham	tons	2,962	3,399

Source: The Office of Industrial Economics

Ready-to-eat products as snacks are attracting many food manufacturers and start-ups to enter the snack food business. There are a lot of items of snacks in the world market. Some's made of fruits, agricultural materials, and typical materials with specific flavors. Crispy-fried fish skin is one of the food snacks that is known well in Thailand and other countries in the same region. It is made of fish skin that has been cut off from fish meat, and it can be kept dry for some time before being fried. Besides, after frying the fish skin, it can be seasoned with some typical and local ingredients. So, crispy-fried fish skin can be eaten as food or snacks.

However, the crispy-fried fish skin food business is quite complicated for food manufacturers. Since fish skin is the major raw material is a by-product of other industries, it is very hard to control the raw material inventory for its industry, and there are only three kinds of fish skin that can be used, such as salmon, cod, and dory (Sutisai P., Interview, January 15, 2021). The factories have to plan the flow of production factors from the upstream to downstream deliberately, otherwise, it will cause a lot of problems in the production line, and it affects the whole crispy-fried fish skin business. Business owners not only must be alert in the highly competitive market of ready-to-eat products but also adapt themselves suitably in the business world. Therefore, it is very interesting to study and analyze the flows of crispy-fried fish skin food business,



including its value chain and supply chain management. Furthermore, the useful guidelines from a case study of a crispy-fried fish skin company can be applied for developing the supply chain management efficiently.

## 2. Objectives

The objectives of this research were

- 1) To study the supply chain management of a crispy-fried fish skin product in the food export industry
- 2) To analyze the supply chain management problems of a crispy-fried fish skin company
- 3) To make the guidelines of the supply chain management for a crispy-fried fish skin company

## 3. Materials and Methods

This research used materials and methods as follows:

### 3.1 Research design

This research is qualitative research that is designed to study and analyze the supply chain management of a crispy-fried fish skin product in the food export industry and study specifically in a crispy-fried fish skin company that is one of the distinguished crispy-fried fish skin companies in Thailand. Eventually, the result of this study will be a useful guideline for those who are interested in supply chain management. This research started by studying all concerned documents, both the secondary data and the primary data, of ready-to-eat products, and scoped only in crispy-fried fish skin business in Thailand. A crispy-fried fish skin company is an alternative for this study since it has been in this type of business for almost 20 years as a manufacturer and exporter.

### 3.2 Research instruments

As the qualitative research, data collection was both from secondary data and primary data sources. Two major research instruments used were observation and in-depth interviews. The interview with 3 keymen of a crispy-fried fish skin company was made online because of the infection of the COVID-19 nearby the factory. The topics for the interview were set on about the supply chain management, value chain, and states of problems affecting by the COVID-19.

### 3.3 Research analysis

After the data collection stage, all data would be analyzed qualitatively by using content analysis. The analysis was on the supply chain management and value chain. Since, the information collected by the interview of the keymen of the company of a crispy-fried fish skin business, the research used the content analysis for examining and evaluating all of the information. Content analysis is a research technique used to make replicable and valid inferences by interpreting and coding textual material. By systematically evaluating texts, qualitative data can convert to quantitative data (Pfarrer, 2021). Likewise, SWOT analysis and the 7 R's of logistics were made from a crispy-fried fish skin company in this stage.

## 4. Results and Discussion

### 4.1 The overview of a crispy-fried fish skin company

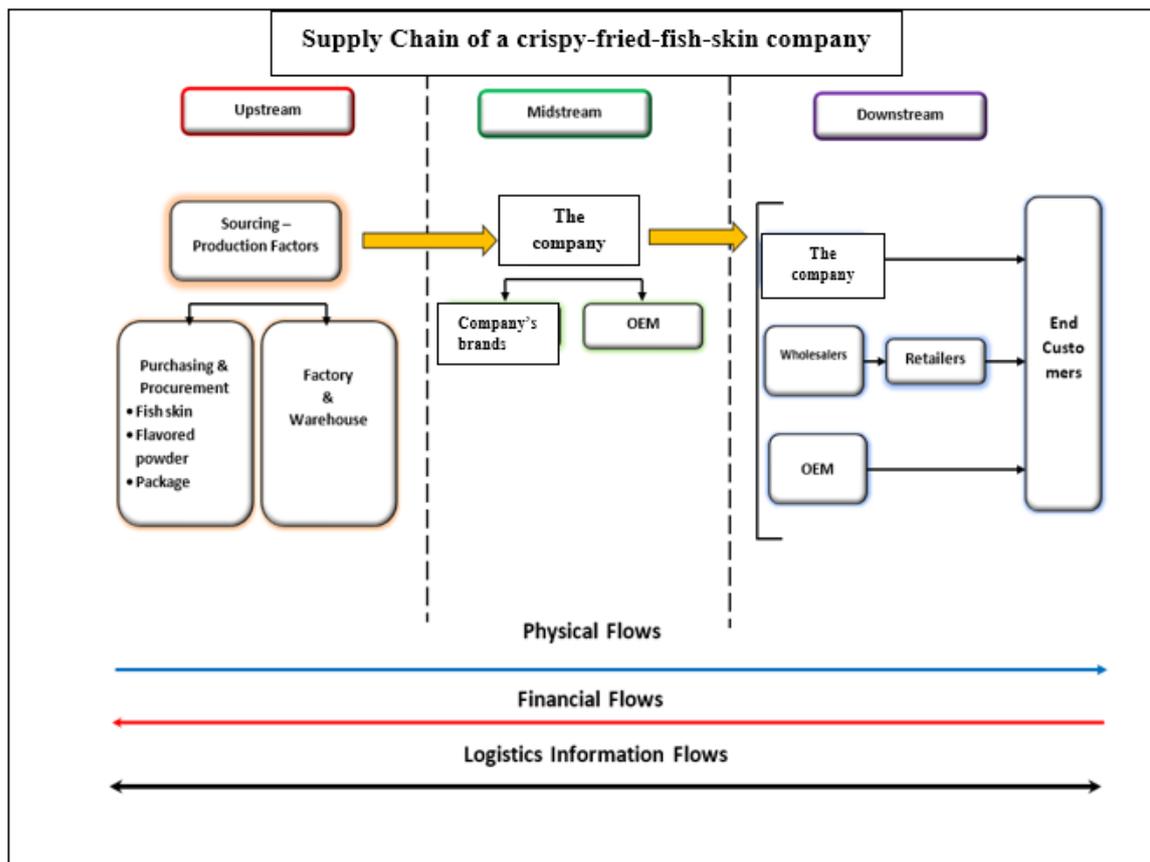
A crispy-fried fish skin company used as a case study of this research has been founded since B.E. 2542 (1999) by the founder who has experienced in producing and selling pork cracking (Khaep Mu), one of Thai snack made of pork skin with an attached layer of fat, and well-known as crispy pork rinds in Thai cuisine. His business went on for two years both in wholesale and retail markets. He felt that the market was highly competitive and most manufacturers were in a price war, so he tried to look for new products. He spent almost two years frying the fish skin instead of pork skin and finally achieved. He had changed his production line and built the new factory in Samut Sakhon province, the industrial zone near Bangkok. He has started to produce only crispy fish skin products with various flavors, sold them in the domestic market, and offered to produce for OEM customers. Nowadays, the factory has met domestic and international standards, such as Thai FDA, Halal, GMP, and HACCP. He has been successful both domestically and internationally. At



present, he is trying to bring his brands to the ASEAN market started in CLMV (Cambodia, Laos, Myanmar, and Vietnam) (Khoomduang W., Interview, January 28, 2021).

#### 4.2 The supply chain management of ABC company

A crispy-fried fish skin company has its supply chain management as shown in Figure 1: Supply Chain in a crispy-fried fish skin company. It can be explained by three parts; physical flow, financial flow, and logistics information flow, respectively.



**Figure 1** Supply chain of a crispy-fried fish skin company

##### 1) Physical flow

Physical flows are about the sourcing and production factors as upstream, a crispy-fried fish skin company activities as midstream and crispy-fried-fish skin products flow to the customer as downstream, respectively.

The major production factors of crispy-fried-fish skin products are fish skin from salmon, cod and dory fish, palm or rice bran oil, flavored powder, and packaging. The factory has purchased fish skin from four countries; Norway, Sweden, China, and Vietnam. It is very difficult to plan for procurement each year, because the nature of this material is its own, by-product material, and the quantity has changed seasonally. Therefore, the fish-skin inventory plan is the most delicate matter in the production line, and its price affects the costs of products. Secondly, the prices of frying oil have changed daily, and it depends upon the quantity that the factory orders as well. Moreover, its quality changes by the storage duration, which is the second factor that affects the production costs. The crispy-fried fish skin company's administrator has carefully



planned for the inventory of fish skin and frying oil semiannually and quarterly, respectively. So, the factory can stock all these materials at low prices for the whole year. There are two steps of procurement; selecting and getting raw materials and checking and weighing them before keeping them in the temperature-controlled warehouse.

The proportion of its brands and OEM productions is about 80:20. Hence, the factory controls the production line by asking the OEM customers to plan once for a quarter, especially the exporting OEM ones. If not, the price will be changed. Besides, the factory has to make deals with others, such as flavor powder, packaging, and container. There are ten steps in the midstream as follows:

- a. Washing fish skin
- b. Reweighing
- c. Mixing with seasonings and ingredients (the first time)
- d. Drying
- e. Cutting (depends on the order)
- f. Frying
- g. Mixing with specific seasoning powder (the second time)
- h. Packing
- i. Storing
- j. Delivering

All processes are under control with food standards of domestic and international institutions.

The downstream of production is to send crispy-fried-fish skin products to the customers. However, it depends on the types of customers as shown in Figure 1. There are three different ways to send products to customers; directly by the company's delivery in a traditional way (offline) and online, indirectly by wholesalers, and by OEM.

## 2) Financial Flows

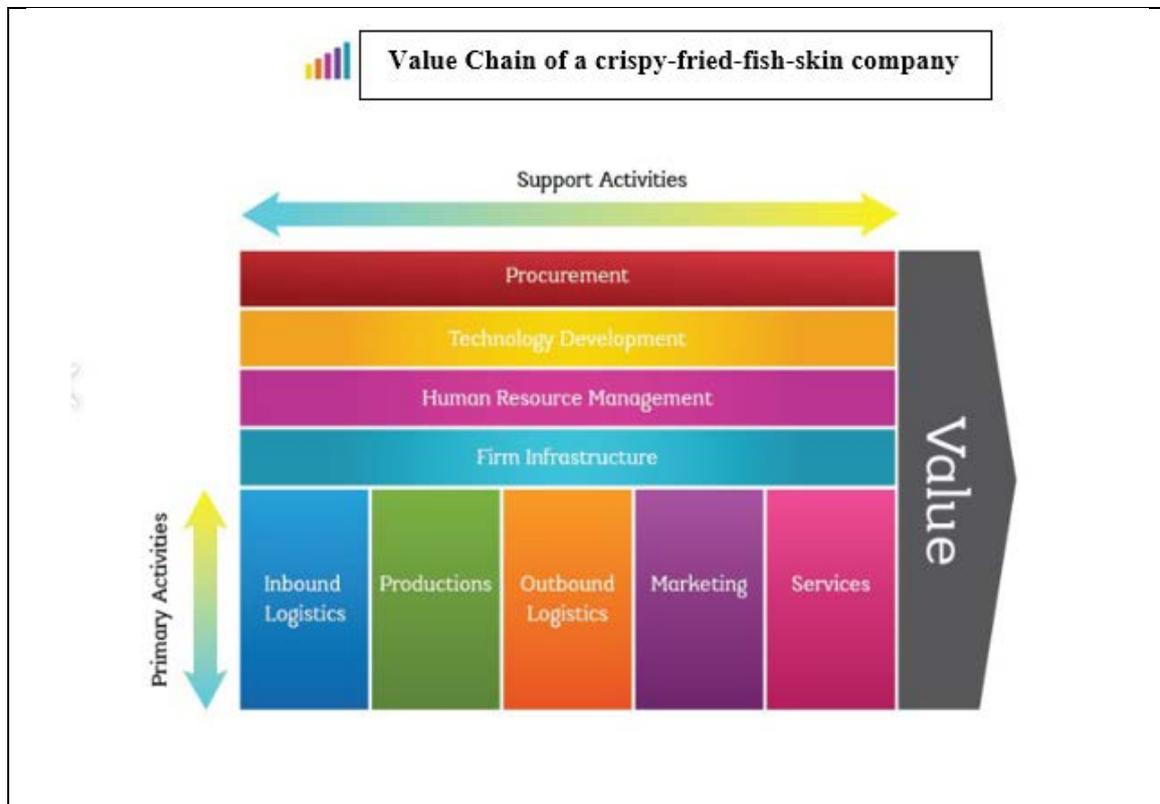
There are financial concerns in each stream of the production line and it must flow freely, if not it will cause some effect to the whole production line, for example, the OEM customers have to pay 50% of total costs when submitting purchasing order, and the rest before getting their finished goods. At present, the company's owner has realized the costs of raw material inventory, both its costs and financial costs, so the annual plan has to be divided into quarter plans. Nonetheless, it has not been successful because of the fluctuation of the prices of the raw materials.

## 3) Logistics Information Flows

When the company has started to export its products to Singapore and Canada in 2018, they realize that the informant of each logistics must be collected and analyzed in the end. It's very useful and helpful for planning their production line. In addition, it can help in reducing costs of inventory and fulfilling customers' needs. A crispy-fried fish skin company has ultimately developed many products for each type of customer. There are more than ten flavors in 2020, and they can be sold in the domestic market under the company's brands and OEM brands both in the traditional market, and modern trade and convenience stores. They can export directly and indirectly to 5 countries with 75% of production capacity.

### 4.3 Value Chain of a crispy-fried fish skin company

The value chain is used to analyze the competitive advantage. Competitive advantage cannot be understood by looking at a firm as a whole. It stems from the many discrete activities a firm performs in designing, producing, marketing, delivering, and supporting its products. Therefore, the chain value disaggregates a firm into its strategically relevant activities to understand the behavior of costs and the existing and potential sources of differentiation (Christopher, 2016).



**Figure 2** Value chain of the company

Figure 2 shows the value chain of the crispy-fried fish skin company selected as the case study in this research. The information of each part is summarized from the contents of three keymen of the company; the owner, production manager, and marketing manager.

The value chain can be applied to the supply chain management as value advantage shown as follows;

#### Part I: Primary Activities

1) Inbound logistics – The company has managed incoming raw materials like fish skin and frying oil by using the logistics information collected for almost ten years. The costs of raw material inventory reduce efficiently by about 15% while the wastes have lowered more than 80% (Adisak Khoomduang, Interview, January 28, 2021).

2) Productions – the company can develop the production line and meet the international food standard. Furthermore, it has fulfilled the customers' needs by offering new seasonings, for example, Thai spicy soup (Tom Yum Khung flavor), Chinese Spicy taste (Mahla taste), Thai herbs mixed with fried fish skin. It indicates that logistics information is helpful for production as well. It makes sale volume increase by about 20% at the end of 2020 (Khoomduang A., Interview, January 28, 2021).

3) Outbound logistics – the company has developed its outbound logistics by using outsources for sending products to customers, so the customers can receive the products daily. Since crispy-fried-fish skin product is bulky; big packaged size but light, its transportation cost is one of the major costs of production, both domestic and international markets.

4) Marketing – With the logistics information, the factory's administrators have understood that they cannot keep the proportion between their own brands and OEM brands as 20:80. Then they have started to



promote their own brands increasingly. However, they have considered business ethics as well, they will not launch their brands in the places of the OEM customers (The annual report 2020, 2021).

5) Services – It is an important part to fulfill the customers not only with the company's products but also with some help, such as promotion costs, information, after-sale services for the OEM customers.

#### Part II: Support Activities

1) Procurement – It clearly shows that the products are in a highly competitive market both in the production line (raw material) and product market. Sourcing new raw material markets is necessary, and the networking of raw materials is made among manufacturers and producers. It helps for shortages of raw materials and sharing information of prices' fluctuations.

2) Technology development – Production technology is unavoidable for present manufacturers. So, the company has implemented new technology, not only just for production but also for logistics, marketing, and administrative works. They try to develop more capital intensive in the production line by using automatic machines for frying fish skin, packing the products, and checking the contaminants.

3) Human resource management – At present, the company has established an R&D department for developing new products, especially Thai food flavors.

4) Firm infrastructure – The company is one of three international-standard factories in Thailand; therefore, its infrastructure is under international standards, and it is assessed annually by many domestic and international organizations. Some infrastructures are added for food standards and safety, even for matching with international trade agreements.

Primary activities and support activities are integrated for increasing values and value advantage, so the company has still kept going on its business in the COVID-19 spread. It shows that sale volumes are higher than the normal situation and can export the products to new foreign countries, such as China, Malaysia, and Australia. The total margin increases tangibly and intangibly.

#### 4.4 The integration of 7 R's logistics

Effective supply chain management can be measured in many different ways. One of the measurements is the integration of 7 R's logistics. 7 R's logistics consists of the right product, right place, right price, right customer, right condition, right time, and right quantity. It ensures that the whole process of logistics is carried out effectively (MITSDE, 2018).

The integration of 7 R's logistics of the company can be summarized in Table 3: 7 R's logistics integration.

**Table 3** 7 R's logistics integration

7 R's Logistics	Agree	Remarks
Right Product	✓	Ready-to-eat food, snack, special favors
Right Place	✓	Urbanization, new lifestyle – New Normal (online market)
Right Price	✓	It varies on the various markets. (low-medium-high)
Right Customer	✓	Domestic and foreign markets
Right Condition	✓	Distributed by the company and OEM, business pattern
Right Time	✓	COVID-19 situation
Right Quantity	✓	75% of production capacity
Integration	✓	It's totally combined and indicated by the company's owner.

The result of the integration of 7R's revealed from the notion of the company's owner that he had made the right decision to start his new business from crispy pork rinds to crispy fried fish skin. He didn't change but adapted by changing raw material and added some techniques. It was the right product and right place at first because of the lowly competitive market at the beginning. The domestic market was the first place to launch new products, especially in noodle shops, northeastern-style food shops. Crispy fried fish skin products have expanded slowly but firmly in low and middle-income classes since then. The company's set



up the food standards followed the Thai FDA standard and continuously international standards. So, the products cover all low, medium, and high-income classes. It is still suitable for production quantity and product flow into the markets but it is forced to expand the factory and warehouse in the future because the purchasing order from domestic and foreign OEM customers are growing rapidly for 6 months, and according to the production plan, it will be growing for another two years. It's quite hard to reach the business goal if the logistics information is not used, and done these 7R's logistics separately.

#### 4.5 SWOT Analysis

After doing the content analysis in the supply chain management and value chain, the company can finally be analyzed qualitatively in the SWOT analysis as shown in Table 4: The Company's SWOT Analysis.

**Table 4** The company's SWOT analysis

Strengths	Weaknesses
1.High production capacity (2,400 kilograms a day)	1.Small warehouse and infrastructure
2.Strong raw material network	2.High labor-intensive production line
3.Price leader	3.Bulky products
4.Domestic and international standard factory	4.Quantity of raw material fluctuates seasonally.
5.Know-How	
6.Flexible production line	
Opportunities	Threats
1.ASEAN markets	1.COVID-19 spread makes the shortage of labor.
2.BOI promotion	2.Political issues in Thailand and Myanmar
	3.Trade barriers for fish products and the rule of origin standard

As the SWOT analysis shows the strengths of the factory, it can be clarified that the experiences of the owner of the factory help the factory facing the problem of raw material shortage, since fish skins are the by-product of the fish-meat industry. So, it is uncontrollable, and raw-material inventory is necessary to be planned carefully and integrally matched with the purchasing order plans of customers. If the factory cannot plan all activities extensively, the costs will immediately be the major problem of production.

Furthermore, after studying the SWOT table, the strategies can be set for the factory. These strategies will be used as the guideline of the factory to manage the supply chain efficiently. The strategies are as follows:

1. Linkage of raw material data of each period with all suppliers, to procure new suppliers.
2. Research and development for new products by using product attributes, features, and benefits.
3. Increase online marketing channels in many platforms, including online wholesales and retails.
4. Cooperate with the government for trade promotion in foreign countries during the situation of COVID-19 spreads

#### 5. Conclusion

Supply chain management and value chain of crispy fried fish skin products showed that it created some further margin when the company controlled the flows of its production factors effectively. All activities in the mainstream through downstream have flown directly to target customers. It's reasonably difficult to control the quantity and quality of raw material; fish skin since it is the by-product of the fish-meat industry. Fish skin is useless and valueless in the fish-meat industry, and it costs for discarding. When the new industry as crispy-fried-fish skin has accepted these wastes, it can be valuable and makes further value-added on them. It is relevant with the integration of 7R's logistics that if something flows rightly into the right place, it can



be the right product to the right place (market) with the right price to the right customer at the right time under the right condition. The one who can do all 7 right logistics mutually will be successful.

## 6. Acknowledgements

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