

Building Agri-food Service Supply Chain Managerial Framework: A Case Study in International Exhibition

Yi-Hsuan Chen, Yun-Hui Lin, Shou-Der Weng, and Wei-Shuo Lo

Abstract—The present work uses a service supply chain for building a managerial framework to solve problem in the agri-food industry. The agri-food industry is characterized by long and complex supply chains for the delivery of diverse products, including vegetables, fruits, rice, fish and other horticultural produce. To improve management performance, a large number of studies on the agri-food supply chain conducted over the last decade have focused on topics, such as performance measurement, demand management, demand analysis, collaboration, marketing, food safety and quality, partnership, cost, and strategic opinions. However, supply chain excellence cannot be achieved without services; services are an intangible capital in managerial processes. Therefore, a managerial framework is proposed to fill gaps in management. The proposed five-step scanning functions is aimed to understanding the attributes, scope, service problems. A case study of international exhibition shows that the service supply chain management is suitable for agri-food industry.

Index Terms—Agri-food industry, international exhibitions, supply chain management, services supply chain.

I. INTRODUCTION

Transitional supply chain management usually focuses on the issues of material and informational flow. Material flow, also called logistics flow, is the supply-side controlled movement of different raw materials, parts, and semi-finished products from suppliers in the upstream to customers in the downstream. On the other hand, informational flow refers to the demand-side controlled requirements of customers in the downstream addressed to suppliers in the upstream. Agri-food products are diverse, including vegetables, fruits, and dairy food. Based on the nature of production and the features of products [1], agri-food supply chains are established by organizations responsible for the production, distribution, processing, and marketing of agricultural products for the final customers [2].

To achieve its goals, the structure of agri-food supply chain management involves various stakeholders, including farmers, wholesales, collectors, processing or packaging companies, retailers, supermarkets or traditional markets, and customers. These roles interconnect with one another to form a

multiple-interactive chain and network in each country and city, providing the food-supply system.

Recently, a number of important topics on agri-food supply chain management have been broadly discussed, including performance indicators or measurement [1], [3], demand management [4], [5], demand analysis [6], collaboration [7], [8], marketing [9], safety and quality [10]-[12], partnerships and collective action [13], cost approach [14], relationships [15], strategic opinions [16], and so on.

Although the abovementioned studies have provided useful directions and methodology for supply chain management in the agri-food industry, only a few have focused on services. A limited number of studies only partly discussed the concept of services, and as a result, this aspect of supply chain management has not been well emphasized in the agri-food industry.

Therefore, based on a previously conducted research on the vegetable supply chain management of the Co-op Mart system in Ho Chi Minh City, Vietnam [17] and on a review of related literature on agri-food and service supply chain management, the present work aims at building a managerial framework to solve the service problems in the agri-food industry.

The proposed framework is an effective management mechanism that employs five-step scanning functions. Managerial functions are approached at each scanning step as follows:

- The first step is to understand the attributes of the agri-food industry.
- The second step is to determine the scope of the agri-food supply chain.
- The third step is to scan the business-to-business (B2B) and business-to-consumer (B2C) service issues based on the scope.
- The fourth step is to assign the problems to the accountable organizations.
- The fifth step is to mitigate service problems to achieve excellence in agri-food service supply chain management.

This paper was organized into the following sections. The first section describes the problems that emerged in the agri-food industry based on the review of related literature, and its attributes and existing supply chains are then discussed. The related body of literature on service supply chain management is also reviewed because these studies can provide insight into how a shift from a traditional agri-food supply chain to an agri-food service supply chain can best be made. The proposed five-step scanning functions is aimed to understanding the attributes, scope, service problems. A case study of international exhibition shows that the service supply

Manuscript received March 30, 2016; revised April 20, 2016. This work was partially supported by the Ministry of Science and Technology under grant number MOST 104-2745-8-276-001.

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chain management is suitable for agri-food industry.

II. PROBLEMS IN AGRIFOOD INDUSTRY

A. *Scope of Agri-food Products*

The scope of agri-food products can be broadly defined to include any food bred and grown from farm to fork and when processed or packed, becomes fresh, frozen, or concentrated. A number of these products are not only related to vegetables and fruits but also include dairy food [16], red meats [18], flowers [1], tomatoes [3], green beans [13], and rice [10], among others. The different backgrounds of these products have created different agri-food supply chains. Moreover, the different requirements of customers and markets have resulted in these products' domestic sale or exportation. Therefore, agri-food products make supply chain management complicated and difficult because of numerous influencing factors, such as the growing season of the products, environments involved, and growing and delivery factors.

B. *Attributes of Agri-food industry*

1) *Products*

Agri-food products are seasonal and perishable [18]. This attribute concerns food safety, which directly affects human health and the breeding environment. Therefore, a number of food safety and quality standards [10], such as the Hazard Analysis and Critical Control Points (HACCP), International Organization for Standardization (ISO), and Good Manufacturing Practice (GMP), and Good Agricultural Practice (GAP), have been established in recent years. To mitigate problems on food safety, information technology has been used for agri-food products, including traceability and radio-frequency identification (RFID) [13]. This technology can record complete information on products from the farm to terminal retailers. Agri-food products are easily perishable during periods of selling or distribution. Perishable products require fast delivery, as well as consistent and good quality control during procurement and delivery [14].

Therefore, these agri-food product attributes are the significant factors making supply chain management difficult. Based on the nature of production, the products give rise to numerous limitations in managerial processes, including breeding, growing, storage, delivery, and safety.

2) *Chain stakeholders*

Product attributes also affect supply chain stakeholders and supply chain culture. To facilitate the sales of fresh food from farmers to consumers, different stakeholders thus organize the preparation of agri-food products in different chains, where stakeholders [2], such as wholesalers [8], collectors [14], street vendors and shops [19], and supermarkets [5], [9], [14], [19]-[26], all participate. The cultural issue emerges because of the pricing of agri-food products. Poor consumers are usually unable to buy agri-food products from supermarkets [19] because of their limited economic capability. Thus, based on market demand, poor farmers supply products to poor consumers.

Therefore, the complicated attributes of the agri-food

industry are not only related to supply chain stakeholders and the relationships among them, such as network connections with one another, wherein each chain closely interacts or cooperates with multiple-level partnerships. However, they are also associated with dealing with different kinds of consumers in cities and the countryside, which all make managerial and service tasks more difficult.

3) *Markets*

The attributes of the agri-food industry can be recognized through different markets. The first market is the domestic market, and the other is the international market, where countries import agri-food products from producing countries.

A domestic market has a simple supply chain, whereas that of an international market is complicated. International markets usually possess more dynamic factors between buyers and sellers, so the entire supply chain is divided into two parts.

One part is the upstream involving farmers in a country, whereas the other part is the middle or downstream involving wholesalers, traders, supermarkets, or retailers in another country. An example is the tomato supply chain from the Netherlands (upstream) to Germany (downstream).

This supply chain is longer than that normally found in a domestic market. Notably, managerial information flow is also difficult in international markets because feedback on products is rarely received [3].

C. *Proposed Solutions for Problems of Agri-Food industry*

The literature review can help shed light on the problems and attributes in the agri-food industry. Further, managerial solutions can also be proposed to help address the abovementioned problems.

The managerial solutions proposed in related literature are as follows: consumer behavior, supermarket management, buyer-seller relationships, marketing, culture and social factors, functions of a supermarket, strategic coordination, lean management thinking, collaborative commerce, performance indicators or measurement, traceability implementation, transaction costs and procurement regimes, managing quality, collaboration (information exchanges), poor consumers, demand chain management, supermarket opportunities and obstacles, planning models, risks and benefits, business process modeling, farmer organizations, food safety, and quality standards.

Based on the given list of managerial solutions, almost all problems in the agri-food industry have been covered in these proposed topics of management from the upstream to the downstream of the supply chain.

However, although the agri-food supply chain has been broadly discussed because of its importance, and despite the number of proposed solutions to date, the issue of service has not been a primary topic and has only been partially discussed in such context.

Supply chain excellence cannot be achieved without services; services are an intangible capital in managerial processes. Therefore, the proposal of a managerial framework to fill the gaps in management and the determination of a method for the transformation of the agri-food industry into

an agri-food service supply chain are the primary goals of the current paper.

III. SERVICES SUPPLY CHAIN MANAGEMENT

In recent years, the concept of supply chain management has been substantially changed and reframed by service-dominant logic [27]. Understanding and managing the service supply chain can also help businesses retain their competitive advantage in the growing global economy [28]. Services are characterized by intangibility and heterogeneity [29], so service managerial methods are not specifically mentioned in studies on agri-food products and industrial management. In this section, related studies are used as reference to propose steps by which to improve and fill the gaps in the management of the agri-food industry.

A. Related Works

Ref. [30] developed a framework for the service industry in the areas of accounting, auditing, and financial consulting, which were compared with manufacturing. Ref. [31] confirmed the occurrence of upstream amplification effects (rather than the bullwhip effect) on workload in the service supply chain. Ref. [27] proposed a service supply chain model, which satisfies a number of key service processes and flows, including information and cash flow and the management of capacity and skills, demand, customer relationships, supplier relationships, and service delivery. Ref. [32] proposed the IUE-SSC model which covers three units in the chain, namely, the supplier, the service provider, and the customer. The proposed model comprises a number of major activities, such as the management of demand, capacity and resources, customer relationships, supplier relationships, order processes, service performance, and information and technology. Ref. [33] believed that after-sales services for manufactured goods encompass the set of activities that occur after the purchase of a product. Such services are devoted to supporting customers in the usage and disposal of goods. Ref. [34] reported that RFID technology has applications in the global service supply chain. RFID enables the recording of real-time data in ways that effectively and efficiently improve service provision and innovation. Ref. [35] provided a basic service supply chain model which covers the management of suppliers, internal customers, and external customer relationships, as well as service delivery, capacity, and information. Ref. [36] provided a model that illustrates the relationships in the services supply chain network for service outsourcing, including bridge, bridge decay, and bridge transfer. The study reported that buyers should continue to interact actively with customers and to monitor closely the supplier to prevent such supplier from solidifying its bridge position. Ref. [37] indicated that social capital has a positive effect on the performance of a service firm supply chain and can also improve the supply chain operations of service firms through significant variations in processes. Ref. [38] provided a conceptual framework of service supply chain management, which includes three interdependent elements, namely, network configuration, management processes, and management components.

Ref. [39] believed that the features of a service supply

chain have the ultimate purpose of meeting individual demand. They also introduced various concepts, such as the existence of more operating risks, increased costs for coordination, the presence of service operators at the core, and the achievement of the value of services when customers are on the move. Ref. [40] proposed a service module provided by suppliers. Each module includes the service interface, activities, targets, and resources. The use of a service integrator will enable the service module to meet customer needs. Ref. [41], [42] used the cruise ship industry to explain the importance of a service supply chain. One aspect is related to information technology in RFID. The effect of RFID and other technologies on the efficiency of the service supply chain of a cruise corporation was explored. The implementation of RFID, aside from improving the accuracy of data, was also found to reduce direct labor requirements. The other aspect focused on cruise ship supply chain management, wherein the strategic, tactical, and operational planning levels of the company were used to determine the key characteristics of the tourism industry, which is an integral part of providing service to consumers. Ref. [43] provided a service supply chain model that established an integrator-based approach with information flow as the key and system management as the guarantee. The management of capacity, demand, relationships, finance, and service delivery also play an important role in the entire process. Ref. [27] believed that service-dominant logic focuses on the process of service versus a goods-dominant or manufacturing logic that focuses on the production and provision of output.

Based on this review of related work, different research methods in the area of service management were found to have been broadly discussed, including models, frameworks, and applications of the concept in the service supply chain. However, improvement steps are needed to guide directly the application of the service supply to the agri-food industry. Therefore, the proposed improvement steps are discussed in the next section.

B. Proposed Improving Steps

Although numerous models and frameworks have been proposed in the body of related work to explain the importance of the service supply chain, a number of these studies more clearly described the necessary improvement steps, which are specific, step-by-step measures that can be utilized by businesses.

Ref. [44] described a five-step process to help companies rapidly achieve service supply chain excellence as follows:

Step 1. Understand your service supply chain.

Step 2. Determine how your service supply chain can be measured.

Step 3. Develop a business case for improvement.

Step 4. Develop and execute a service supply chain strategy.

Step 5. Sustain performance improvement.

Ref. [45] had six primary suggestions (steps) for improving service supply chain management.

Step 1. Understand the magnitude of purchase spending required by the service;

Step 2. Segment the purchase spending based on value and risk;

Step 3. Allocate appropriate resources to the area of service supply chain based on economic return;

Step 4. Increase the level of professionalism of the service purchasing team;

Step 5. Measure effectiveness and ensure proper business controls;

Step 6. Place the best people in the service supply chain.

Ref. [46] proposed a supply chain management perspective and managing framework on the purchase of services from offshore suppliers. The framework suggests the following important steps for businesses:

Step 1. Identification of need

Step 2. Determination of responsibilities

Step 3. Analysis and sourcing

Step 4. Negotiation and contracting

Step 5. Implementation, measurement, and management of relations

Ref. [39] proposed a number of principles on efficiency assessment in a service supply chain as follows:

Step 1. Combination of assessment for customer performance and utility evaluation;

Step 2. Combination of static and dynamic evaluations;

Step 3. Combination of real-time and cycling evaluations;

Step 4. Combination of whole and mesh evaluations.

After the review of related literature and improvement steps, the factors supporting the improvement of management in the agri-food industry have been identified.

The first factor is that related studies have provided directions covering most areas of service management, including models, frameworks, and the application of the concept in the service supply chain.

The second factor is that improvement steps suggesting how enterprises can evaluate and implement the service supply chain in the operation of enterprises have been proposed. These improvement steps can be used in different perspectives.

Therefore, based on the abovementioned supporting reasons, the present work attempted to design a managerial framework.

IV. BUILDING A MANAGEMENT FRAMEWORK

Two primary topics are discussed in this section. The first topic deals with the concept of how service can fill the gaps in the agri-food industry. And then based on the concept of such gap the second topic deals with building the steps needed for the design of a managerial framework, each element of which is also explained.

A. Filling the Gaps in Services

Agri-food products are perishable and have different methods of production. Therefore, the previously proposed solutions are primarily applicable to the traditional concept of supply chain management. This phase is called the “before phase.”

Although many solutions have been proposed and applied to the industry during the “before phase,” most of these solutions rarely focused on the issue of service management. Therefore, achieving excellence in supply chain management is impossible without focusing on services. This phase is

called the “gap phase.”

After the “before phase” and during the “gap phase,” the concept of service supply chain management was implemented to fill the existing gaps in the agri-food industry. The implementation of this concept resulted in the transformation of agri-food supply chain management into agri-food service supply chain management. This phase is called the “after phase.” Fig. 1 illustrates the primary purpose of the current paper.

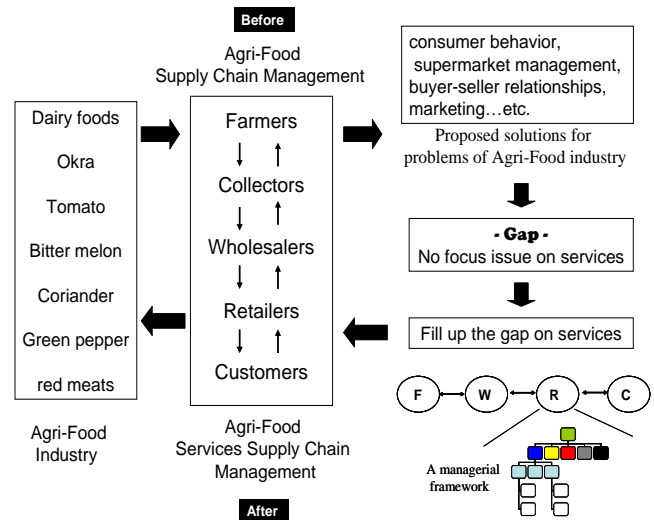


Fig. 1. Concept of filling the gap in services.

B. Building Steps for the Managerial Framework

Related theories should be considered when establishing a managerial framework. Supply chain management and service supply chain management are the primary theories considered in the present work, and a number of useful principles under these theories are integrated into the proposed building steps.

The building steps for the managerial framework are as follows:

Step 1. Understanding the attributes of the agri-food industry;

Step 2. Determining the scope of the agri-food supply chain;

Step 3. Scanning the problems of B2B and B2C services based on the scope;

Step 4. Assigning the problems to the accountable organization;

Step 5. Mitigating the problems on services and achieving excellence in the entire agri-food service supply chain.

After the five-step building processes, a managerial framework is designed. Fig. 2 shows an explanation of each function of the managerial framework and illustrates how this framework can be used by retailers.

Goal: To organize a business such that costs are minimized, and gains are increased.

How to do: The methods for service management are utilized to solve service problems as follows. And the agri-food service supply chain between B2B, B2C, and business is shown Fig. 3.

- B2B: supplier relationship and food safety quality management;
- B2C: demand and customer relationship management.

- Business: information, case flow, capacity, and marketing management

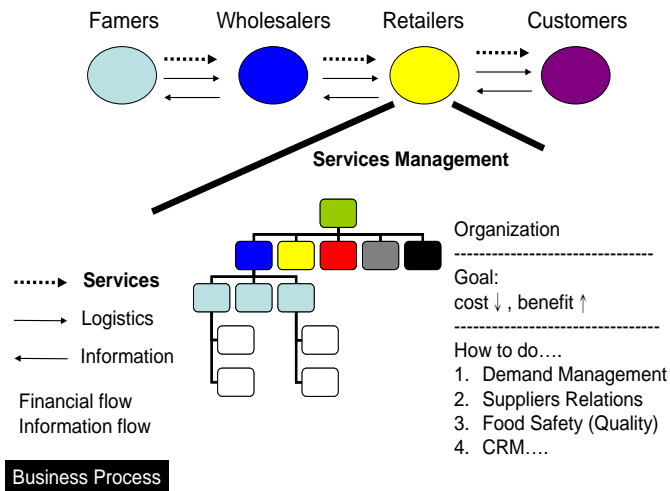


Fig. 2. Argi-Food service supply chain managerial framework.

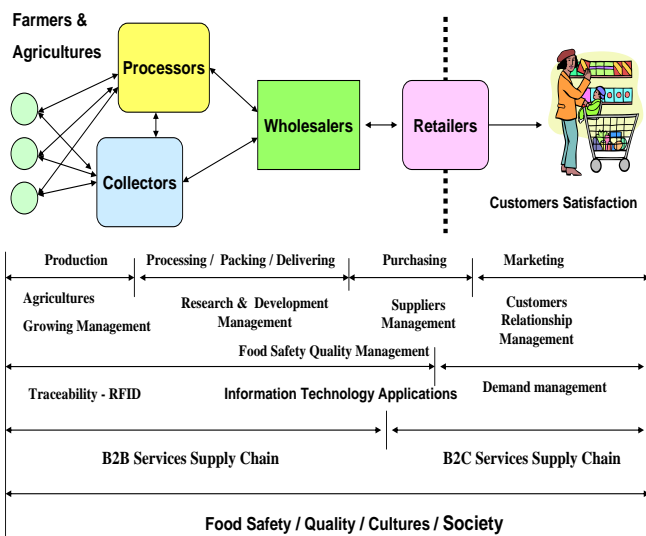


Fig. 3. Argi-Food services supply chain.



Fig. 4. Accountable organizations in the agri-food services supply chain.

- Organizations responsible: Services management mapping is used so that managerial functions and responsibilities are delegated to different divisions and thus the goals of the organization are achieved. Fig. 4 shows the different managerial responsibilities and illustrates how industrial domain knowledge can be

applied to service managerial processes and to different divisions.

- Business process understanding: The members of each division are expected to understand organizational goals and responsibilities, and they also have to recognize clearly the three primary business processes and flows. These processes include information on customer requirements and product logistics, and how these factors are related to the services process. The flow of finance and information is also important in B2B and B2C transactions. Fig. 5 shows the purchasing service processes executed through different divisions.

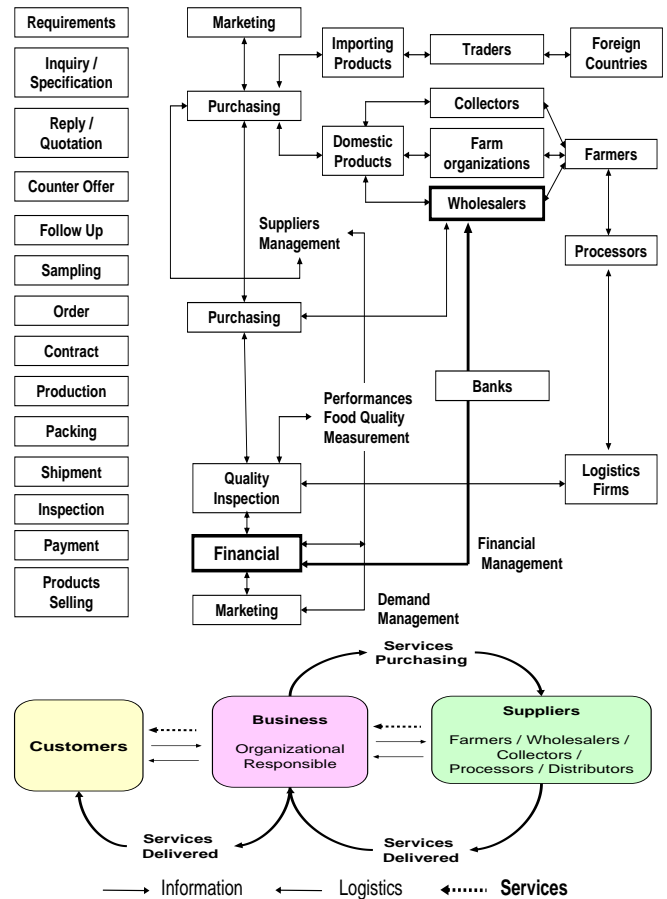


Fig. 5. Purchasing service process.

- Purchasing service processes comprise many steps which are all related to business divisions and suppliers. The divisions responsible for each step are as follows:
 - 1) Marketing division: determines the requirements and documents the feedback and reactions of customers.
 - 2) The supplier management team under the purchasing division: processes the requirements from the marketing division, and then proceeds with the following steps: inquiry/specification, reply/quotation, counter offer, follow-up, sampling, order, and contract with suppliers (wholesalers, collectors, or farm organizations)
 - 3) The quality inspection team under the purchasing division: inspects purchased products based on orders and food safety standards.
 - 4) Financial division: verifies that the inspected products pass standards and checks the quotation and contract for payment. This division has to be aware of daily

income and transactions, and calculates the overall sales volume to support marketing analysis.

- 5) Human resource division: trains each member of the divisions. This division manages the learning and preparation of the domain knowledge on agri-food service supply chain management.
- Industry understanding: Understanding the characteristics of an industry is not easy because each industry usually covers heterogeneous domain knowledge. Domain knowledge is not only related to the agri-food product itself but is also sometimes related to different quality standards and delivery conditions. This knowledge has a significant effect on the entire service supply chain.

The proposed managerial framework considered the practices in the industry using the theory of supply chain management as foundation. Based on this foundation, a five-step building process was developed to establish all the elements necessary to complete the managerial framework.

V. A CASE STUDY SHOWS AT INTERNATIONAL EXHIBITION

In this section is to show how the built steps of managerial framework are suitable for service industry. We use a practical case that is a traditional agri-food manufacturing. The company would like to explore their products to international marketplace; however, the company does not know how to solve their problem. Therefore, the proposed managerial framework and steps thus used for this company.

Step 1. Understanding the attributes of the agri-food industry.

The company is production some of different salmon flosses. Their products are similar with most agri-food attributes. But, they are agri-food processing manufacturing.

Step 2. Determining the scope of the agri-food supply chain.

The agri-food supply chain in this company is as below:

- B2B:
 - 1) Supplier relationship: from the fish suppliers they how to sustain supply.
 - 2) Food safety quality management: fish suppliers they have to prove their fishes are fitted the safety quality.
- B2C:
 - 1) Demand: the company has to control all of required information from customers. That is the needs of demand side.
 - 2) Customer relationship management: the company according to all of the information from customers, then production different kinds of salmon flosses by order, and then to manage the relationship when customer need.
- Business:
 - 1) Information: the company collects the information of upstream and downstream of agri-food supply chain from B2B and B2C. Therefore, they make the different management such as food safety quality management, customer relationship management.
 - 2) Marketing management: the company uses the information of B2B and B2C, and then explores the marketplace. One of important marketing channel is to show their products at international exhibitions.

Step 3. Scanning the problems of B2B and B2C services based on the scope.

Before they attend an international exhibition as an exhibitor, they scan what problems are existed between B2B and B2C services. Because, B2B services are related to the suppliers, and B2C services are related to the customers. However, most of traditional manufacturing ignores this point, and lost some business opportunities.

Step 4. Assigning the problems to the accountable organization.

Fig. 6 shows the service supply chain of salmon flosses company. For solving the problems existed between B2B and B2C services flow, therefore, the company explores their services flow one from B2B services to the suppliers, and another one B2B services to international exhibition. Their manufacturing department thus supports the sales marketing department.

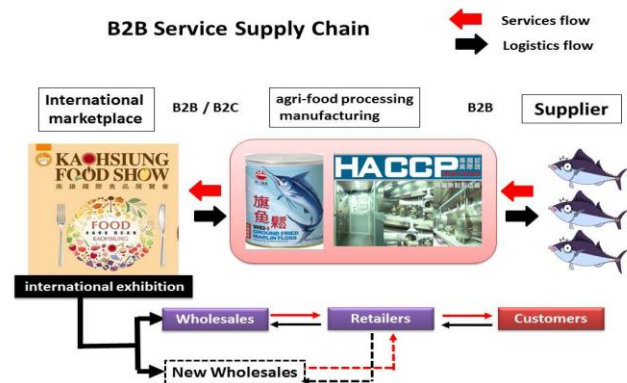


Fig. 6. The service supply chain of salmon flosses company.

Step 5. Mitigating the problems on services and achieving excellence in the entire agri-food service supply chain.

Fig. 7 shows the service supply chain of salmon flosses company at international exhibition.



Fig. 7. The service supply chain at international exhibition.

VI. CONCLUSION

The agri-food industry is characterized by long and complex supply chains. Traditional supply chain management is focused on performance measurement, demand management, demand analysis, collaboration, marketing, food safety and quality, partnership, cost, and strategic opinions, but the importance of service management is only partially considered. As a result, agri-food supply chain management has gaps in terms of service management.

In the present paper, the proposed managerial framework utilized the theory of service supply chain to fill the gaps in service management in the agri-food industry. During the constructing process, a variety of related studies on the agri-food supply chain and service supply chain were referenced and employed to complete the proposed five-step building process.

Considering that an organization can improve managerial functions by itself, the domain knowledge on the agri-food industry possessed by the accountable organization was also emphasized. Therefore, each organizational function can work with other functions through this domain knowledge.

A. Implications

The present work has several important implications on the agri-food industry, supply chain management, services supply chain management, and organizational management.

The agri-food industry is complicated, featuring products which have different methods of production, are easily perishable, and are difficult to store and deliver. However, a number of technologies have been applied in this industry in recent years. Aside from different areas of management and food economy, information technology also has been applied for food quality and safety, including traceability and RFID.

The implications of supply chain management have also been extensively discussed in both the upstream and downstream of the agri-food industry. This concept is a great contribution to this industry as it enables the management of different stakeholders in each chain. These stakeholders include farmers, farm organizations, collectors, wholesalers, retailers (including street vendors), supermarkets, and consumers. Each of these stakeholders is confronted with different managerial issues, therefore making the industry more productive and presenting challenges to the field of management.

The implications of service supply chain management will become an increasingly important topic in the agri-food industry. Although this concept is not well known yet and does not receive a great deal of attention to date, the present work has found that services supply chain management can fill the gaps in traditional agri-food supply chain management.

The implication of organizational management is another issue. In the current paper, previous studies were found to lack discussions on this area because industry and supply chain management are not focused on this issue. However, services supply chain management was found to be capable of enhancing the entire business process based on a variety of organizational responsibilities.

For example, the purchasing division takes responsibility for supplier management and quality inspection. The supplier management division considers domestic purchase or importation. The quality inspection division is responsible for food quality and standards, such as ISO and HACCP.

These implications are inseparably linked in the domain knowledge of the agri-food industry, making these supply chain network implications meaningful in the field of management.

B. Future Research

More studies are needed to fill the gaps in this unexplored

field. The agri-food industry can benefit from the use of different principles of service supply chain management, especially in specific chains, including wholesalers, retailers, and supermarkets.

On the other hand, the issue of IT application is also important because of the limited resources for software and hardware. RFID is especially important in the management of the entire industry supply chain.

The limitation of the present work is that the managerial framework was not empirically examined. However, the current paper has not only provided a conceptual framework for the agri-food industry but has also explored service supply chain management as a means to fill the gaps in agri-food supply chain management. Moreover, practical research experiences in this field, such as those from a study on the vegetable supply chain management of the Co-op Mart system in Ho Chi Minh City, Vietnam, have been considered.

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